



Leica Builder Series

How to Guide

Version 1.0
English

- when it has to be **right**

Leica
Geosystems



To use the product in a permitted manner, please refer to the detailed safety instructions in the User Manual.

Table of Contents

In this manual	Chapter	Page
	How to Getting Started	5
	Description of the User Interface	5
	Explanation of the Screen	9
	Explanation of the Displayed Data	10
	How to Set Up Builder Anywhere or over a Ground Point	12
	How to Level Up Builder	14
	1 How to Set Up Builder to Gain a Known Station	16
	1.1 Set Up Anywhere Based on Given Control Line	16
	1.2 Set Up over Control Line	18
	1.3 Set Up Anywhere with Given Coordinates	20
	1.4 Set Up over One Known Point with Second Known Point	24
	1.5 Set Up Using Nails from Profile Boards	28

2 How to Set Up Builder with Height	32
2.1 Transfer Elevation to Builder Placed over Height Benchmark	32
2.2 Transfer Height from Benchmark to Builder	34
3 How to Measure	38
3.1 Measure a Site Surface	38
3.2 Make a Site Survey with Point Descriptions	40
3.3 Measure the Centre of Trees or Columns	42
3.4 Measure the Angle between Inlet and Outlet of a Planned Concrete Manhole	46
4 How to Layout	48
4.1 Layout Points from Memory	48
4.2 Layout Points from Plan with Line & Offset	50
4.3 Layout Nails on Profile Boards from Control Line	54
4.4 Layout Nails on Profile Boards from Coordinates	56
4.5 Layout Pins with Offset for Rounded Curbs	60
5 How to Measure Heights	64
5.1 Measure the Height of Inaccessible Points	64
5.2 Measure the Height Difference between Two Inaccessible Points	68
5.3 Place a Datum Line	70
5.4 Determine the Height of the Bottom of a Manhole	74

6 How to Measure Areas & Volumes	78
6.1 Measure and Calculate a Plane Area	78
6.2 Measure and Calculate a Tilted Area	82
6.3 Measure and Calculate Volumes	86
7 How to Check Verticality	90
7.1 Check the Verticality of a Wall	90
8 How to Check Plane or Tilted Surfaces	94
8.1 Check a Plane Surface	94
8.2 Check a Tilted Surface	96

How to Getting Started

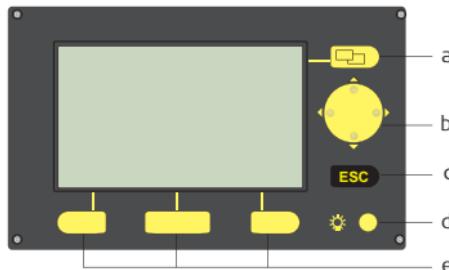


Depending on the Builder model some functions might not be available.

Description of the User Interface

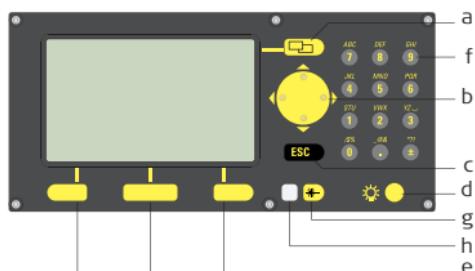
Keyboard

Builder 100, 200 and 300



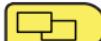
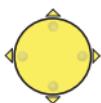
- a) Page key
- b) Navigation keys
- c) ESC
- d) Light
- e) Function keys

Builder 400 and 500



- f) 10-digit keypad
- g) EDM key
- h) LED

Keys for all Builder models:

Key	Description
	Changes tab in the tab bar. Press to switch between the CONFIG , THEO , PROG and DATA tab pages.
	<ul style="list-style-type: none">Move the focus on the screen.Start the edit mode for edit fields.Control the input bar in edit and input mode.
 ESC	<ul style="list-style-type: none">Leaves the current menu or dialog without storing changes made.If THEO mode is active: press for approximately 5 seconds to access System Info.
	Turns the display light including reticle illumination on and off.
	Correspond to the three softkeys that appear on the bottom of the screen when the screen is activated.

Keys only for Builder 400 and 500:

Key/LED	Description
	<ul style="list-style-type: none">Press button short: to access the EDM settings.Press button long: to toggle between red dot and prism.
	Alphanumeric keys
	<ul style="list-style-type: none">LED white: EDM type is prism.LED red: EDM type is red dot.LED flashes once if the EDM setting has changed by toggling or when a measurement is taken.LED blinks if EDM measures in tracking mode.

Sidecover keys

Key	Description
	On / Off key. Switches the instrument on or off.
	Switch key. The top end of the Switch key is Switch Key 1, the lower end is Switch Key 2.

Switch key functionality

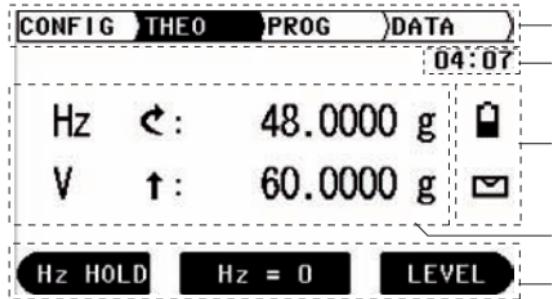
Builder model	Switch key 1	Switch key 2
100 series	Sector beep on/off	-
200 series	Laser pointer on/off	-
300 series	Laser pointer on/off	-
400 series	EDM tracking on/off	Switch between Measure/Record , All in 1 and Measure
500 series	Laser pointer on/off	Switch between Measure/Record , All in 1 and Measure



These settings or modes can also be changed in the **CONFIG** tab page.

Explanation of the Screen

Screen

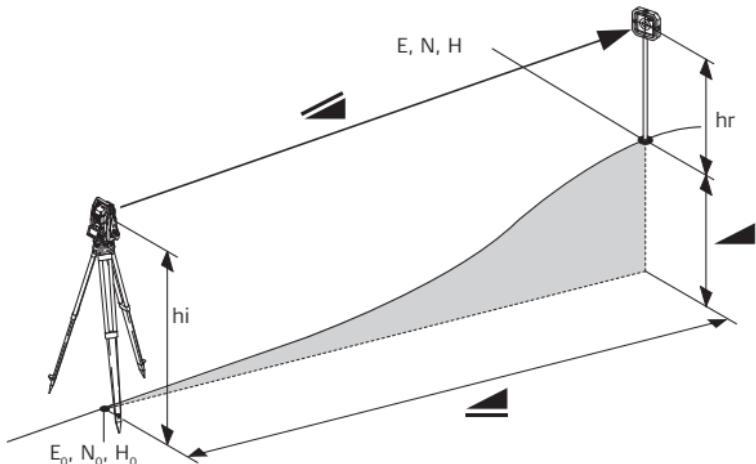


- a) Tab bar
- b) Time
- c) Icons
- d) Screen area
- e) Softkeys

Element	Description
Tab bar	The current active tab is shown in black.
Time	Shows the current time provided that the setting is made in the configurations.
Icons	Shows the current status information of the instrument.
Screen area	The working area of the screen.
Softkeys	Commands can be executed using the Softkeys. The commands assigned to the softkeys are screen dependent.

Explanation of the Displayed Data

Overview

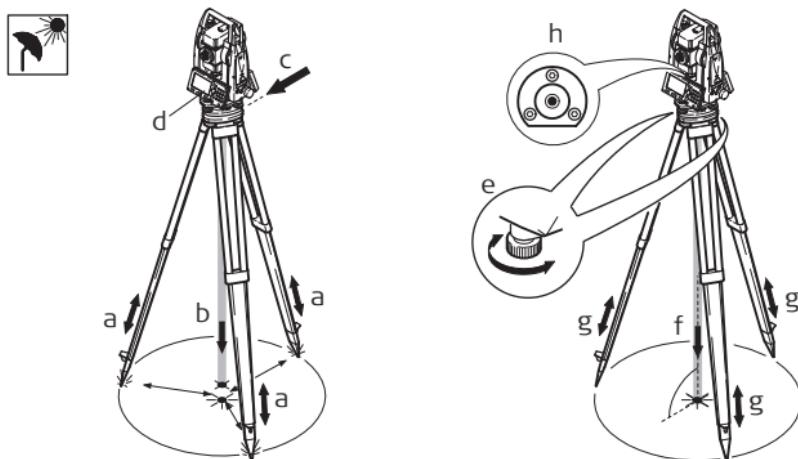


Abbreviation	Description
	Indicated meteorological corrected slope distance between instrument tilting axis and centre of prism/laser dot.
	Indicated meteorological corrected horizontal distance.
	Height difference between station and target point.

Abbreviation	Description
hr	Reflector height above ground.
hi	Instrument height above ground.
E_0	Easting of Station.
N_0	Northing of Station.
H_0	Height of Station.
E	Easting of target point.
N	Northing of target point.
H	Height of target point.

How to Set Up Builder Anywhere or over a Ground Point

Setup step-by-step



1. Extend the tripod legs to allow for a comfortable working posture (a).
2. **Over a ground point:** Position the tripod over the marked ground point, centring it as good as possible (b).
3. Fasten the tribrach and instrument onto the tripod (c).
4. Turn on the instrument by pressing the key (d).

The electronic level and laser plummet are activated automatically after switching on the instrument, if compensator is set to on.

5. **Over a ground point:** Move the tripod legs (a) and use the tribrach footscrews (e) to centre the plummet over the ground point (f).
6. Adjust the tripod legs (g) to level the circular level (h).
7. By using the electronic level turn the tribrach footscrews (e) to precisely level the instrument.
Refer to "How to Level Up Builder" for more information.
8. **Over a ground point:** Centre the instrument precisely over the ground point (f) by shifting the tribrach on the tripod plate (c).
9. Repeat steps 7. (and 8.) until the required accuracy is achieved.

How to Level Up Builder

Levelling up with the electronic level step-by-step

The electronic level can be used to precisely level the instrument using the foot-screws of the tribrach.

1. Turn on the instrument by pressing the  key.

The electronic level and laser plummet are activated automatically after switching on the instrument, if compensator is set to on.

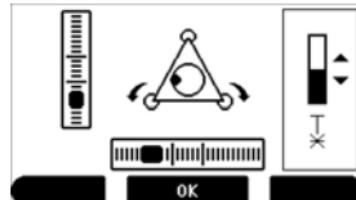
2. Centre the circular level roughly by turning the footscrews of the tribrach.



The bubble of the electronic level and the arrows for the rotating direction of the footscrews only appear if the instrument tilt is inside a certain levelling range.

3. Rotate the instrument until it is parallel to two of the footscrews of the tribrach.

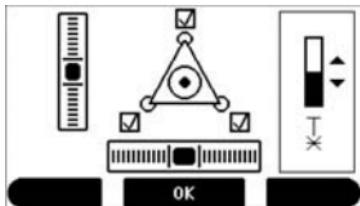
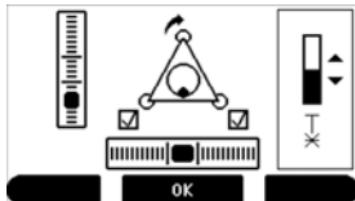
4. Centre the electronic level of this axis by turning the two footscrews. Arrows show the direction for rotating the footscrews. When the electronic level is centred the arrows are replaced by checkmarks.



5. Centre the electronic level for the second axis by turning the last footscrew. An arrow shows the direction for rotating the footscrew. When the electronic level is centred, the arrow is replaced by a checkmark.



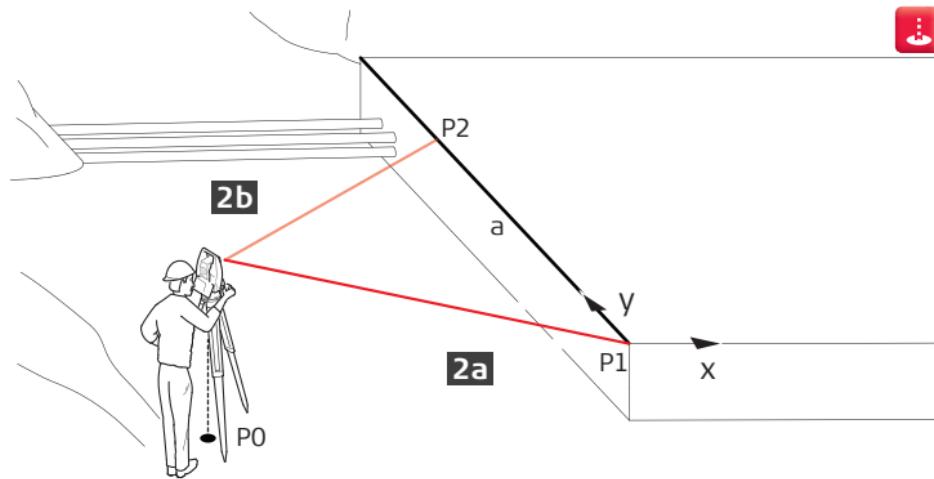
When the electronic level is centred and three checkmarks are shown, the instrument has been perfectly leveled up.



6. Accept with **OK**.

1 How to Set Up Builder to Gain a Known Station

1.1 Set Up Anywhere Based on Given Control Line

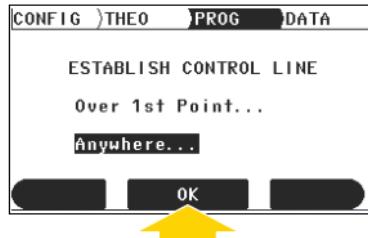
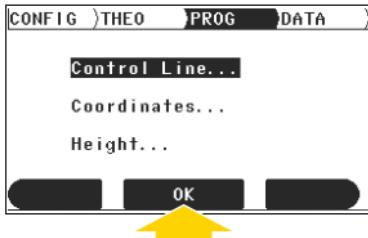
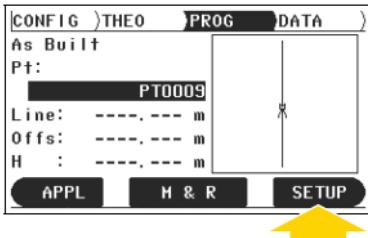


P_0 Station (sought)
 P_1 Start point
 P_2 Direction point
 a Control line

Given:

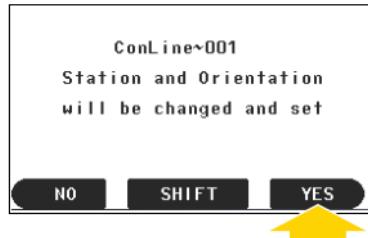
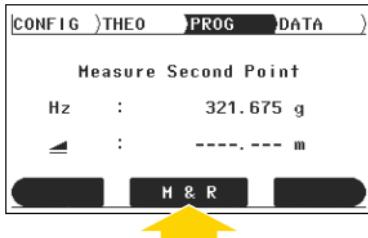
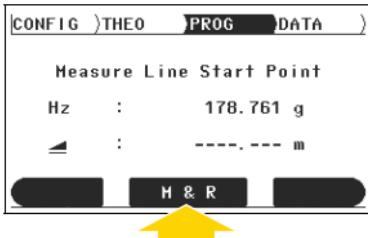
- Start point of control line and one direction point.
- Builder is set up anywhere on site and levelled.

1 In the PROG Tab page, press **SETUP**. Select **Control Line...** and press **OK**. Select **Anywhere...** and press **OK**.

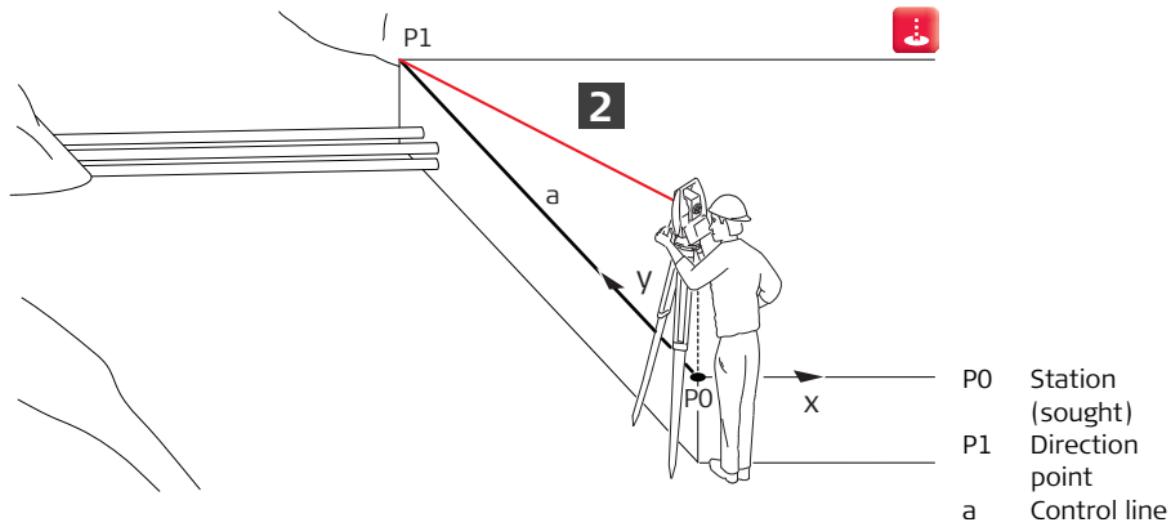


After selecting a programme or setup, you always have to press **OK**. This will from now on no longer be stated but implied.

2 Sight start point of control line [2a] with the telescope and press **M & R**. Sight direction point [2b] and press **M & R**. Confirm new Station and Orientation with **YES**.



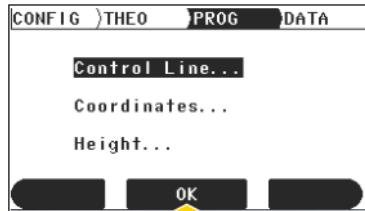
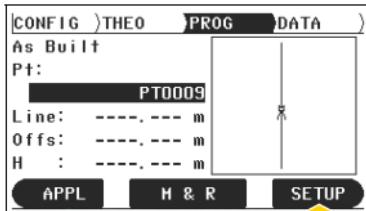
1.2 Set Up over Control Line

**Given:**

- Start point of control line and one direction point.
- Builder is set up over start point of control line.

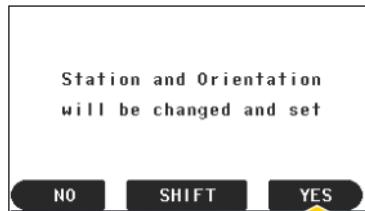
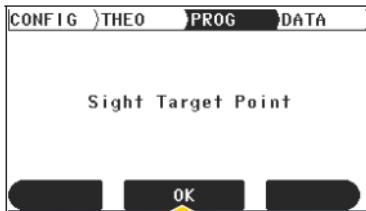
1

In the PROG Tab page, press **SETUP**. Select **Control Line...** and **Over 1st point....**

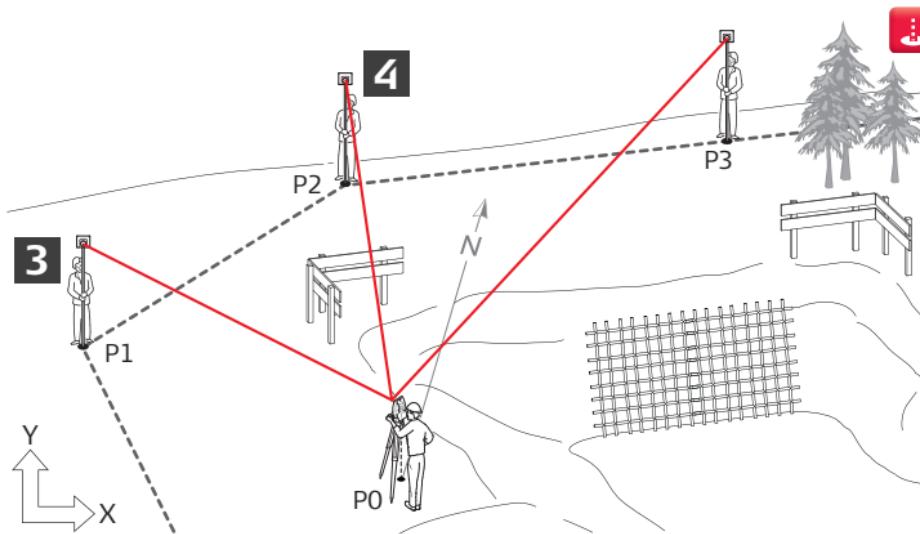


2

Sight direction point and press **OK**. Confirm new Station and Orientation with **YES**.



1.3 Set Up Anywhere with Given Coordinates



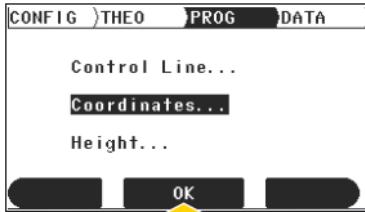
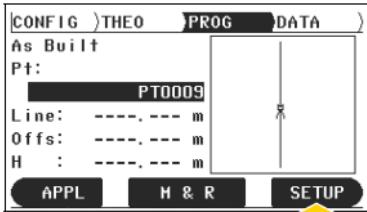
P_0 Station
(sought)
 $P_1\dots$ Known points

Given:

- Two or more points with coordinates have been stored in Builder's memory.
- Builder is set up anywhere on site and levelled.

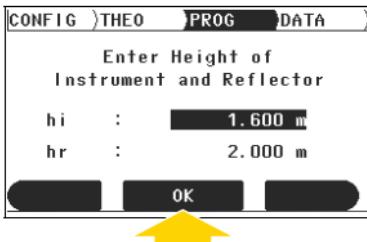
1

In the PROG Tab page, press **SETUP**. Select **Coordinates...** and **Anywhere...**.



2

Enter instrument height (**hi**) and reflector height (**hr**).



It is not required to enter a value for hi. It is only needed if you want to know the height of the ground point. If you enter 0.000 m, the telescope height will be shown.

3

Select the first point and sight it. Press **M & R**.

CONFIG	THEO	PROG	DATA
Select First Point			
Pt :	1100		
E :	999.999 m		
N :	1086.831 m		
H :	118.833 m		
P-LIST		OK	NEH PT

CONFIG	THEO	PROG	DATA
Measure First Point			
Hz :	321.675 g		
▲ :	----.--- m		
		M & R	

4

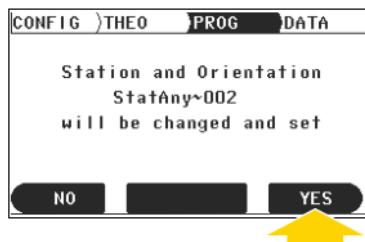
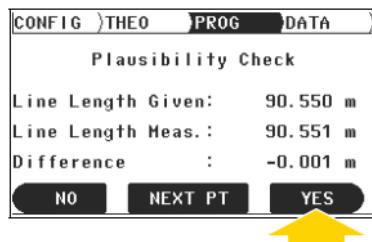
Select the second point and sight it. Press **M & R**.

CONFIG	THEO	PROG	DATA
Select Second Point			
Pt :	1103		
E :	999.909 m		
N :	996.281 m		
H :	102.145 m		
P-LIST		OK	NEH PT

CONFIG	THEO	PROG	DATA
Measure Second Point			
Hz :	252.848 g		
▲ :	----.--- m		
		M & R	H REFL

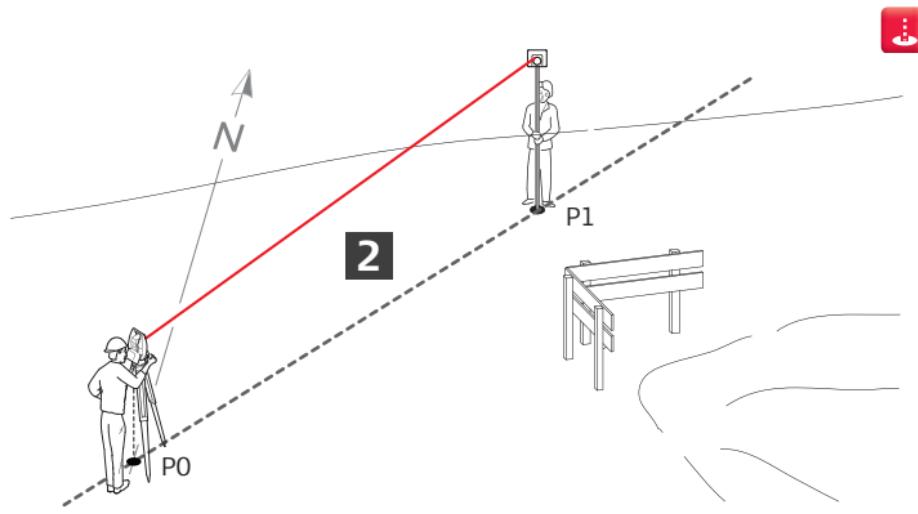
5

Check the results. If they are within the correct deviation, press **YES**. You can measure additional points by pressing **NEXT PT**. Confirm new Station and Orientation with **YES**.



If the results are not within the correct deviation, press **NO** and restart at step 1.

1.4 Set Up over One Known Point with Second Known Point

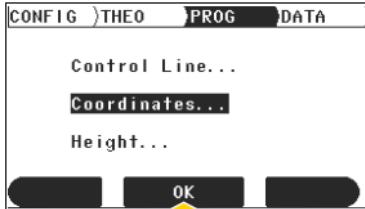
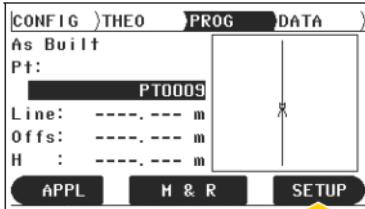


P0 Station
(sought)
P1 Known point

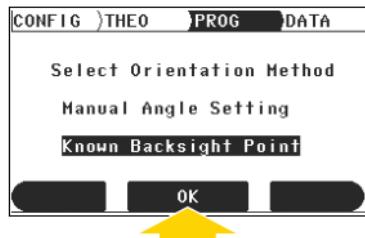
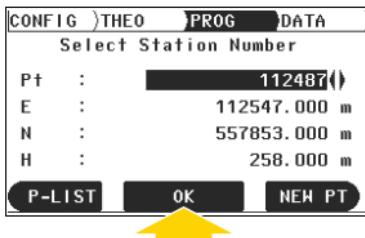
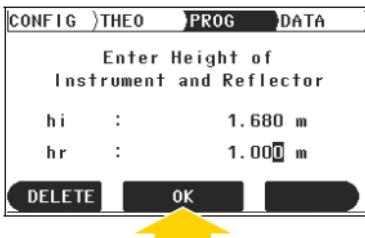
Given:

- Two known points with coordinates.
- Builder is set up over one known point and levelled.

1 In the PROG Tab page, press **SETUP**. Select **Coordinates...** and **Over Known Station....**

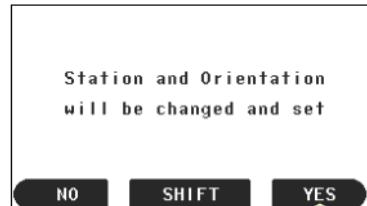
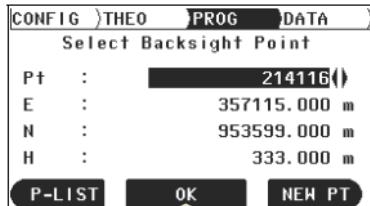


2 Enter instrument height (**hi**) and reflector height (**hr**). Select Station Number (**Pt**). Select **Known Backsight Point**.



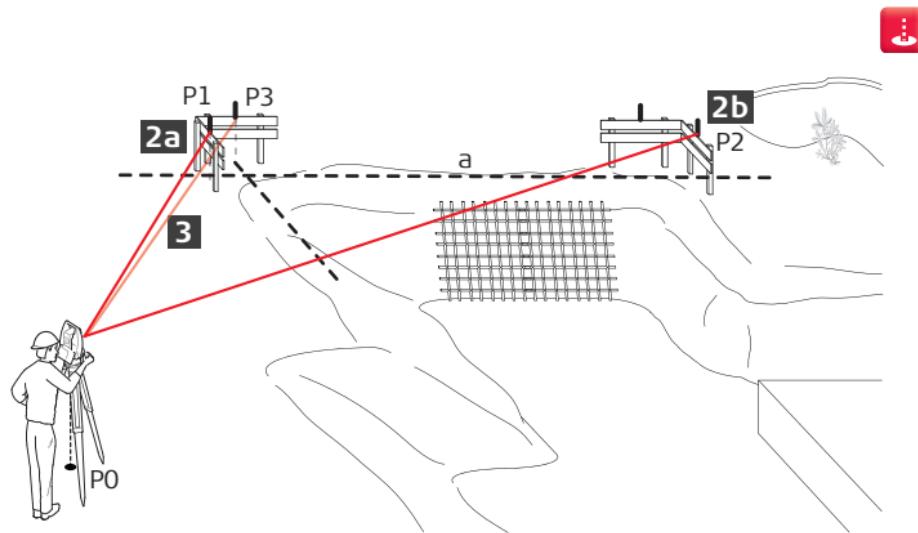
The known backsight point is the second known point.

3 Select number of backsight point (**Pt**). Sight backsight point and press **OK**. Confirm new Station and Orientation with **YES**.



Only the angle will be measured for the backsight point, not the distance. Therefore it is not necessary to use a target on the point.

1.5 Set Up Using Nails from Profile Boards



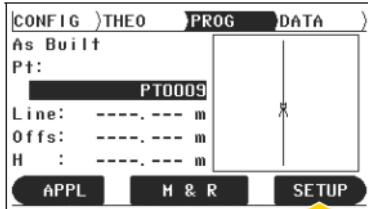
P0 Station (sought)
P1... Known point
a Control line

Given:

- Profile boards with nails and plan.
- Builder is set up anywhere on site and levelled.

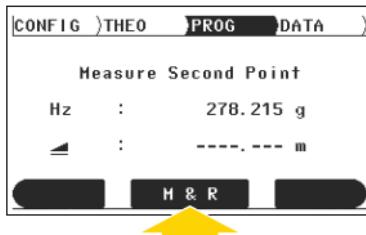
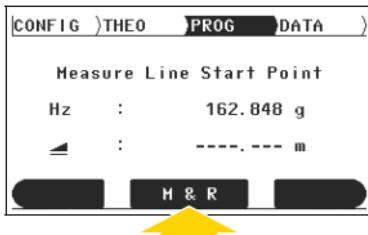
1

In the PROG Tab page, press **SETUP**. Select **Control Line...** and **Anywhere...**.

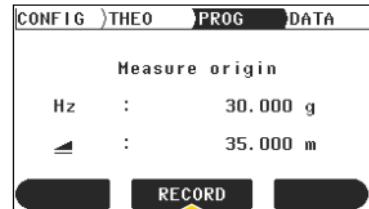
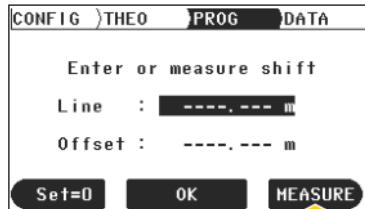
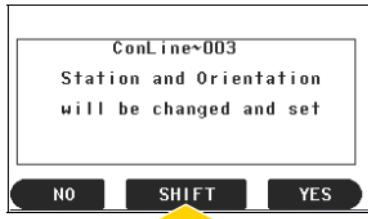


2

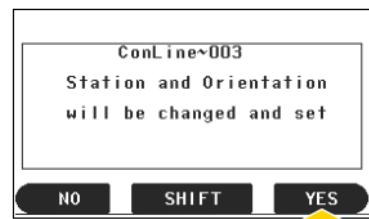
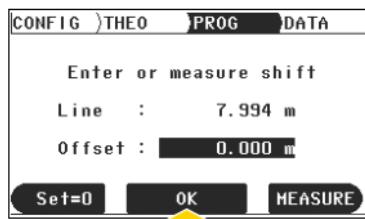
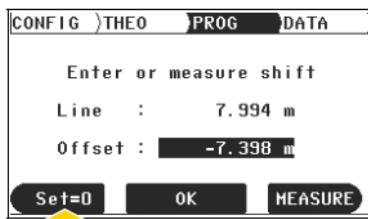
Sight one nail of a line as start point and press **M & R [2a]**. Sight the other nail of the line as second point and press **M & R [2b]**.



3 Press **SHIFT** to move control line in line direction. Press **MEASURE**. Now sight third nail, measure it and press **RECORD**.



4 Select **Offset** and press **Set=0**. Press **OK** to confirm it. Confirm new Station and Orientation with **YES**.



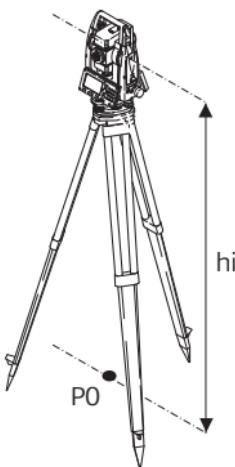


Afterwards, store three or more permanent points outside of the construction site as described in "3.1 Measure a Site Surface" on page 38. In case the profile boards are no longer available, use these points to set up Builder according to "1.3 Set Up Anywhere with Given Coordinates".

2 How to Set Up Builder with Height

2.1 Transfer Elevation to Builder Placed over Height Benchmark

Ih



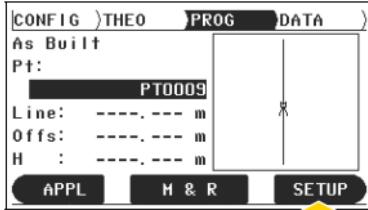
hi Instrument
height
P0 Benchmark

Given:

Builder is placed over benchmark with given elevation and levelled.

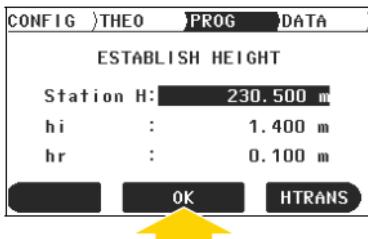
1

In the PROG Tab page, press **SETUP**. Select **Height....**

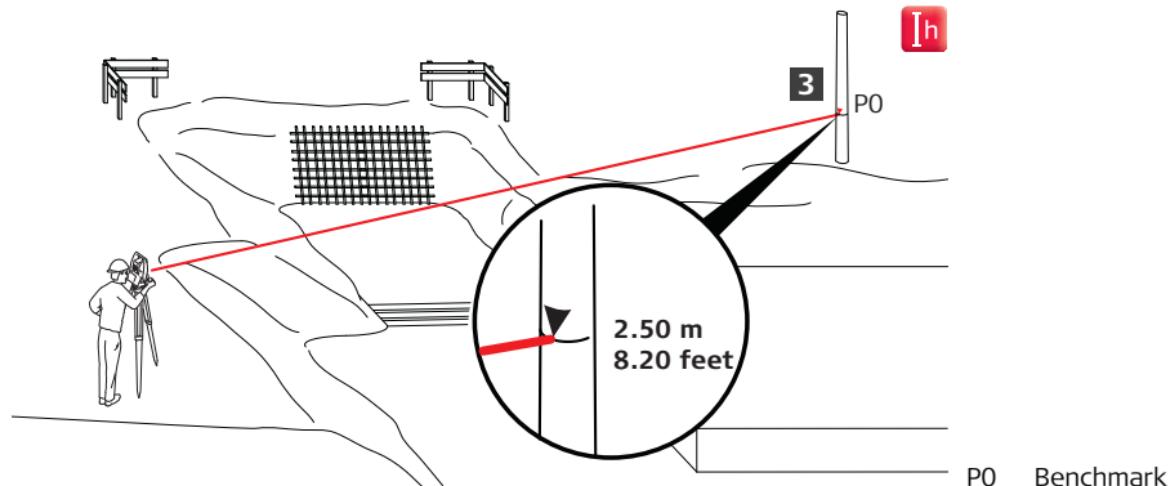


2

Enter elevation of benchmark (**Station H**), height from benchmark to telescope (**hi**) and reflector (**hr**). Press **OK** to confirm.



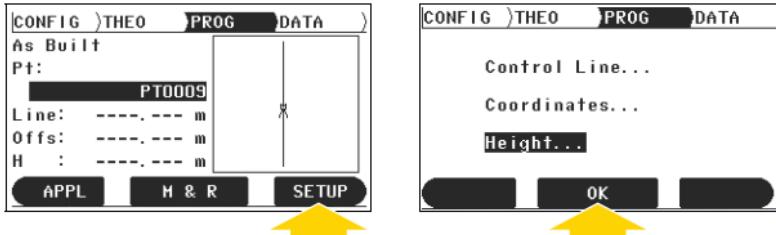
2.2 Transfer Height from Benchmark to Builder

**Given:**

- One benchmark with known elevation.
- Builder is placed anywhere on site and levelled.

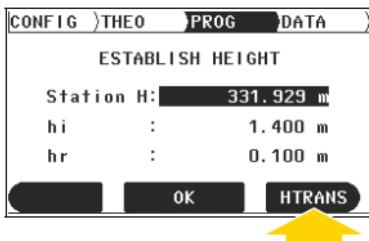
1

In the **PROG Tab** page, press **SETUP**. Select **Height....**



2

Station H shows the previous station height. Enter instrument height (**hi**) and reflector height (**hr**). Press **HTRANS** for height transfer.



It is not required to enter a value for **hi**. It is only needed if you want to know the height of the ground point. If you enter **0.000 m**, the telescope height will be shown.

3 Select benchmark from list (**Pt**) or enter new point. For new point enter elevation of benchmark and press **OK** as shown in centre and right screen.

CONFIG	THEO	PROG	DATA
Select Height Point			
Pt :	112487(1)		
E :	112547.000 m		
N :	557853.000 m		
H :	258.000 m		
P-LIST		OK	NEW PT

CONFIG	THEO	PROG	DATA
Enter Point Coordinates			
Pt :	112488		
E :	-----, ----- m		
N :	-----, ----- m		
H :	-----, ----- m		
ENH=0		OK	

CONFIG	THEO	PROG	DATA
Enter Point Coordinates			
Pt :	112488		
E :	112584.210 m		
N :	557831.250 m		
H :	260.000 m		
ENH=0		OK	

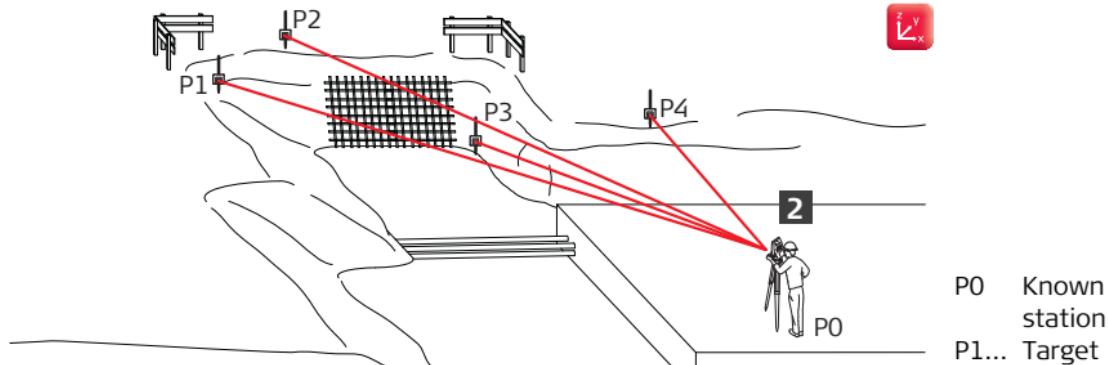
4 Measure benchmark. Confirm new Station Height with **YES**.

CONFIG	THEO	PROG	DATA
Measure Height Point			
PtId:	112488		
Hz:	278.215 g		
¶:	----- m		
		H & R	

CONFIG	THEO	PROG	DATA
New Station Height			
256.488 m			
will be set			
NO		NEXT PT	YES

3 How to Measure

3.1 Measure a Site Surface



P0 Known station
P1... Target



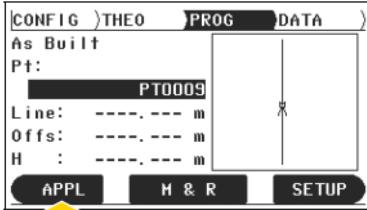
- You can also do this with application **Measure & Descriptor** or **Angle & Distance**.
- This procedure can also be used, for example, by architects and civil engineers for quantity surveying or by carpenters for receiving exact dimensions for the roof framework.

Given:

Builder is set up with known station and height.

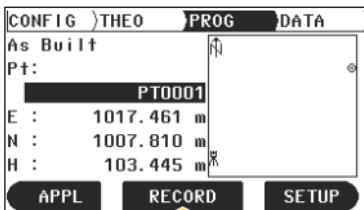
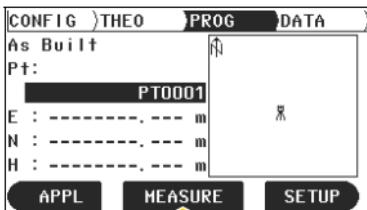
1

In the PROG Tab page, press **APPL**. Select **As Built....**



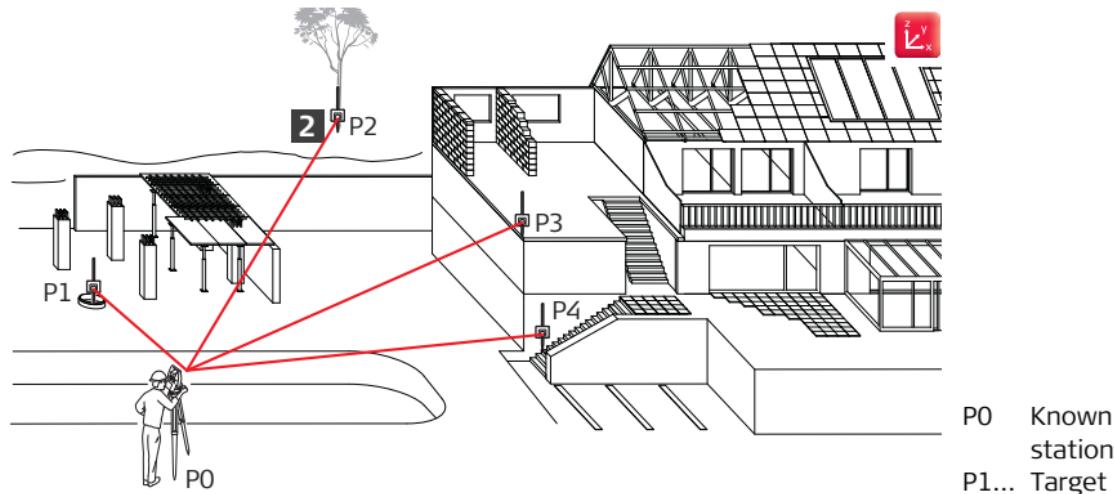
2

Enter ID of starting point (**Pt**), sight target and press **MEASURE**. After measuring, press **RECORD** to store the point. Measure and record as many points as needed.



- For storing points automatically after measuring, switch to measurement mode **All in 1** by pressing Switch key 2.
- Recorded points can be downloaded to a computer using the CDM software.

3.2 Make a Site Survey with Point Descriptions



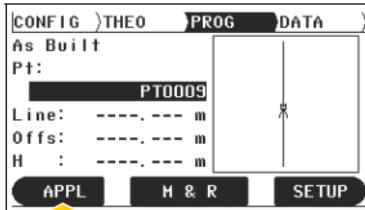
This procedure can also be used, for example, by architects and civil engineers for quantity surveying or by carpenters for receiving exact dimensions for the roof framework.

Given:

Builder is set up with known station and height.

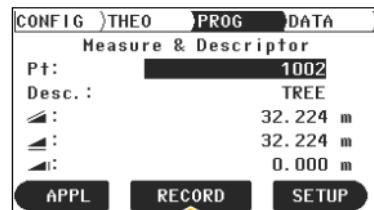
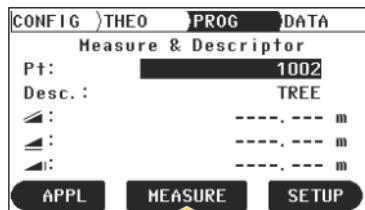
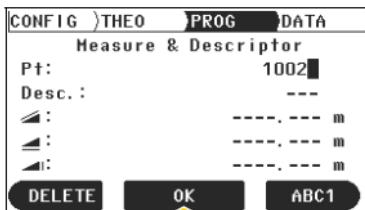
1

In the PROG Tab page, press **APPL**. Select **Measure & Descriptor....**



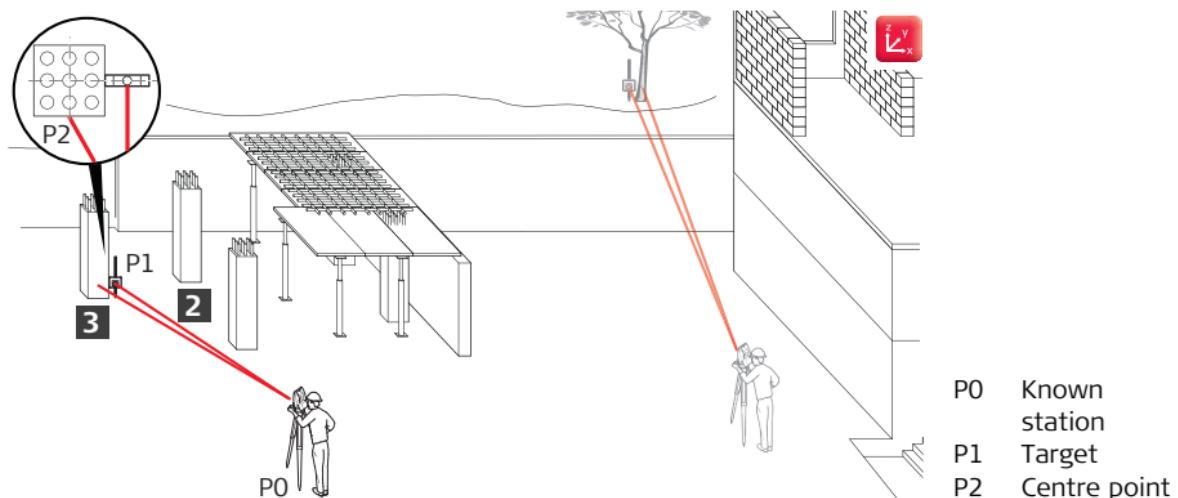
2

Enter ID of starting point (**Pt**), enter a description (**Desc.**) and press **OK**. Sight target and press **MEASURE**. After measuring, press **RECORD** to store the point. Describe, measure and record as many points as needed.



For storing points automatically after measuring, switch to measurement mode **All in 1** by pressing Switch key 2.

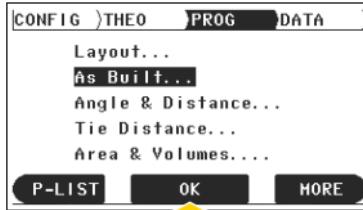
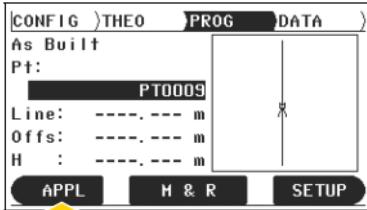
3.3 Measure the Centre of Trees or Columns

**Given:**

- Builder is set up with known station.
- Measure and Record mode is set to **Measure/Record**. Refer to "Sidecover keys" on page 8 on how to switch modes.

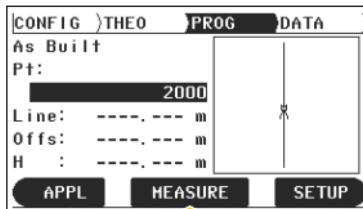
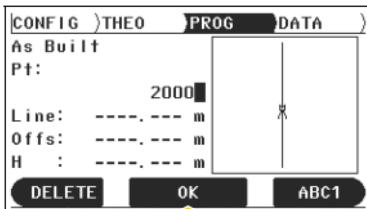
1

In the PROG Tab page, press **APPL**. Select **As Built....**

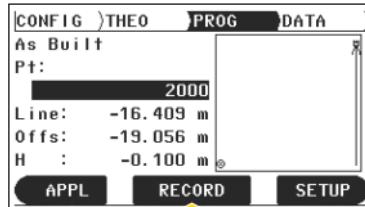
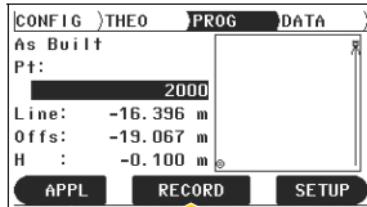


2

Place prism next to tree or column in the same distance as the centre. Enter point ID and sight prism.
Press **MEASURE**.

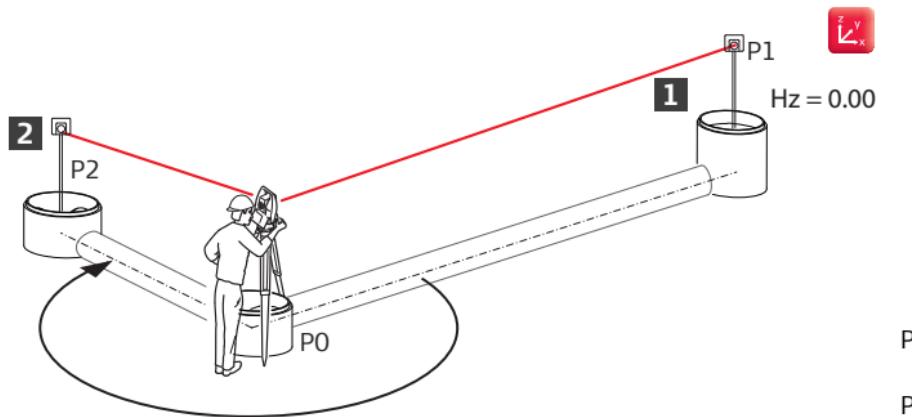


3 Before storing the point, turn instrument and sight the centre of the tree or column. Now press **RECORD** to store the point with the new angle.



This method of turning the instrument before storing a point works in most of the applications.

3.4 Measure the Angle between Inlet and Outlet of a Planned Concrete Manhole



P0 Known
station
P1... Target



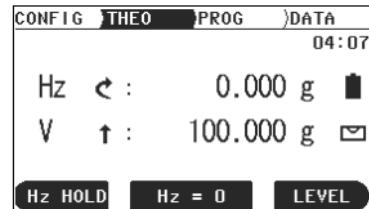
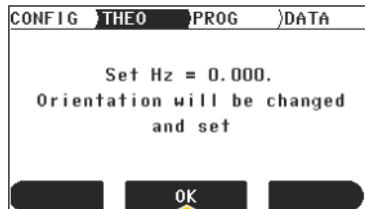
This procedure can also be used, for example, to check a right angle or to determine the angle for an elbow in power line constructions.

Given:

- Builder is placed over a planned manhole position and levelled.
- The position of the other two manholes is known.

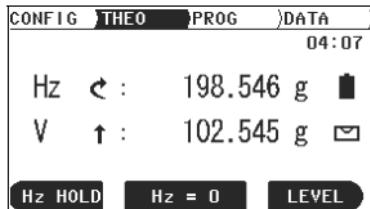
1

In the **THEO** Tab page, press **Hz = 0**. Sight the first manhole and confirm new Orientation with **OK**.



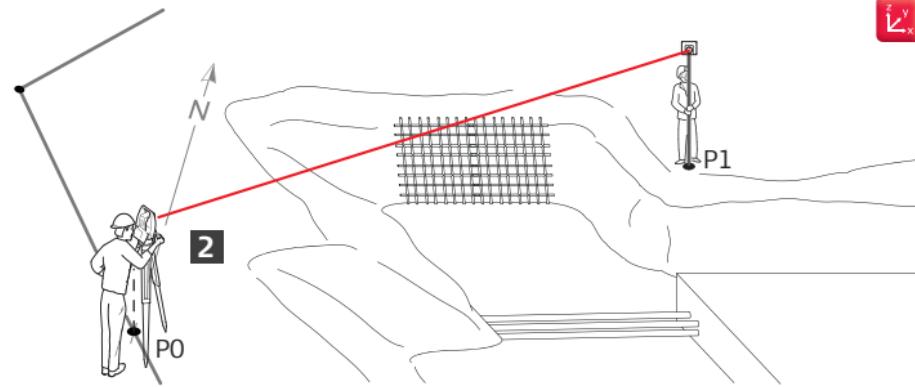
2

Sight the second manhole and notice the shown angle (**Hz**).



4 How to Layout

4.1 Layout Points from Memory



P0 Known station
P1 Layout point



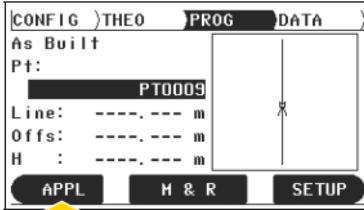
This procedure can also be used for all other points you want to layout.

Given:

- Builder is set up with known station. Setup with height is optional.
- List with layout points and coordinates have been stored in Builder's memory.

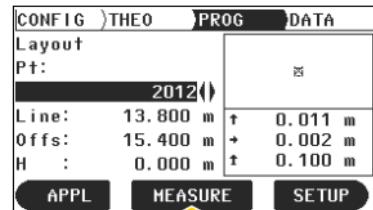
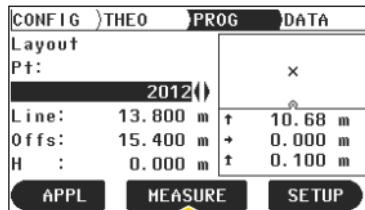
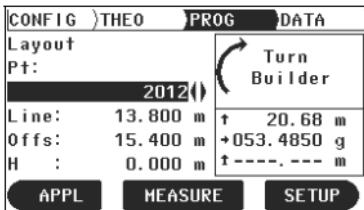
1

In the PROG Tab page, press **APPL**. Select **Layout....**

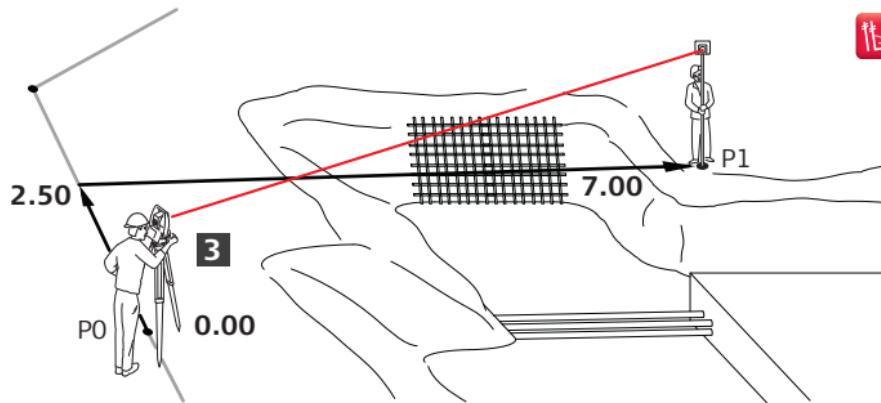


2

Enter ID of point to layout (**Pt**). Turn Builder in the shown direction. Measure until results are within the correct deviation.



4.2 Layout Points from Plan with Line & Offset



P0 Known station
P1 Layout point



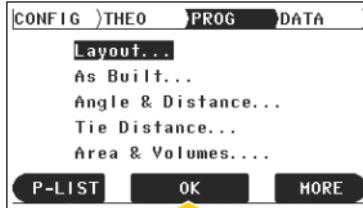
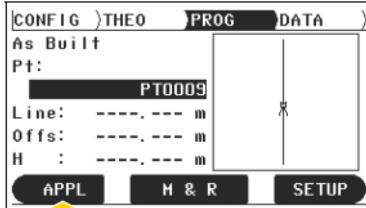
This procedure can also be used for all other points you want to layout.

Given:

- Builder is set up with known station. Setup with height is optional.
- Plan with dimensioning.

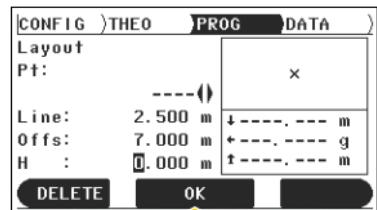
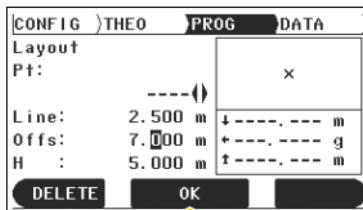
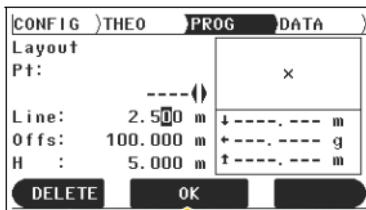
1

In the PROG Tab page, press APPL. Select Layout....

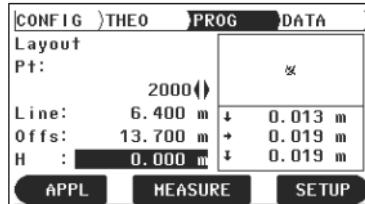
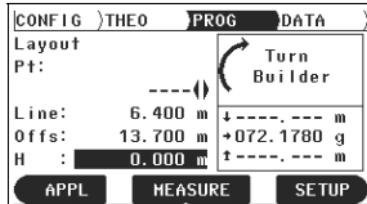


2

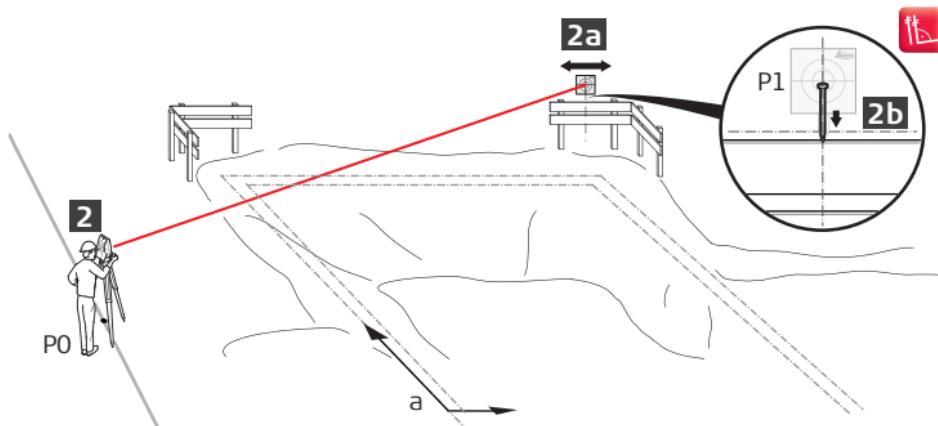
Use Navigation keys to navigate to Line. Enter given value and press OK. Repeat this for offset (Offs) and height (H).



3 Turn Builder in the shown direction. Measure until results are within the correct deviation.



4.3 Layout Nails on Profile Boards from Control Line



P0	Known station
P1	Layout point
a	Control line



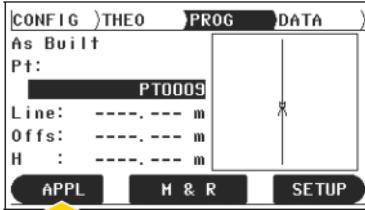
Enable **EDM tracking** and **Laser pointer** while sighting the profile board for a faster workflow. For improved accuracy or for final layout also use a reflector target.

Given:

- Builder is set up with known station. Setup with height is optional.
- Plan with dimensioning.

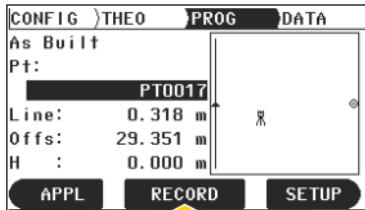
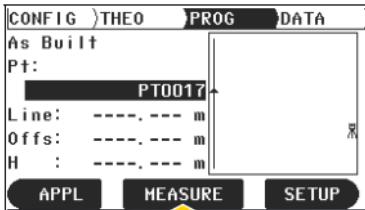
1

In the PROG Tab page, press **APPL**. Select **As Built....**



2

Sight target on profile board and press **MEASURE**. Verify offset value (**Offs**). Note that this value is an absolute value to the control line. Move target to designated offset dimension [2a]. Measure target again until results are within the correct deviation and mark the point on the profile board [2b]. Press **RECORD** to store the point.

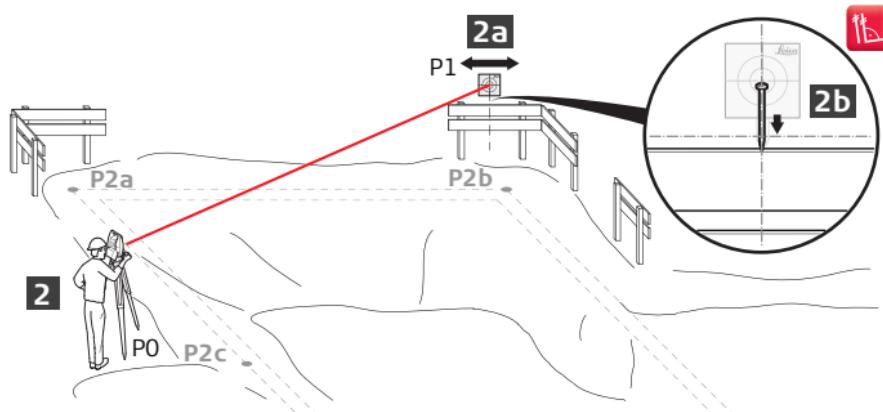


If there are vertical lines to layout, verify **Line** value.



For faster workflow use measurement mode **Measure**. To store the point, switch to **All in 1** or **Measure/Record** by pressing Switch key 2.

4.4 Layout Nails on Profile Boards from Coordinates



P0 Known station
P1 Layout point
P2a.. Coordinate point

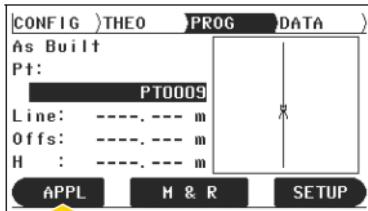
☞ Enable **EDM tracking** and **Laser pointer** while sighting the profile board for a faster workflow. For improved accuracy or for final layout also use a reflector target.

Given:

- Builder is set up with known station. Setup with height is optional.
- List with layout points and coordinates have been stored in Builder's memory.

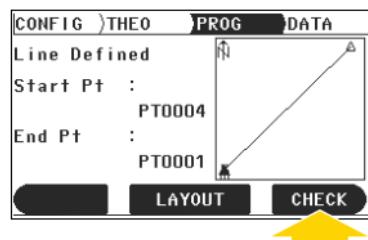
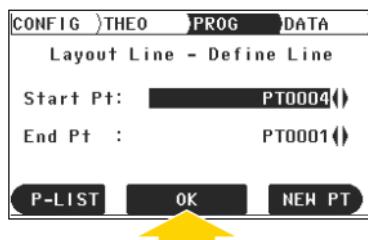
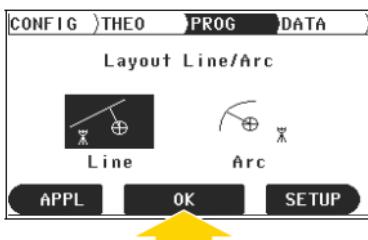
1

In the PROG Tab page, press APPL. Select Layout Line/Arc/Spiral... and Basic....



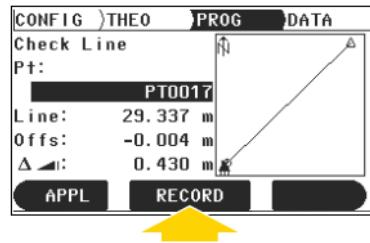
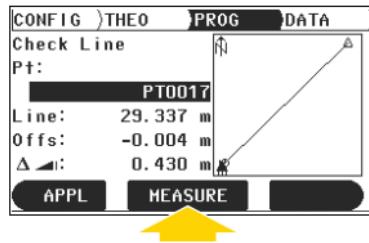
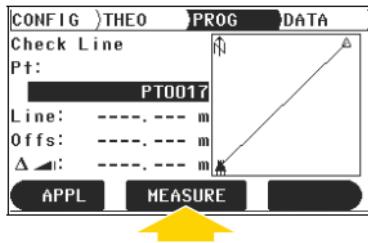
2

Select Line. Enter ID of start point (**Start Pt**) and of end point (**End Pt**) and press OK. Then press Check.

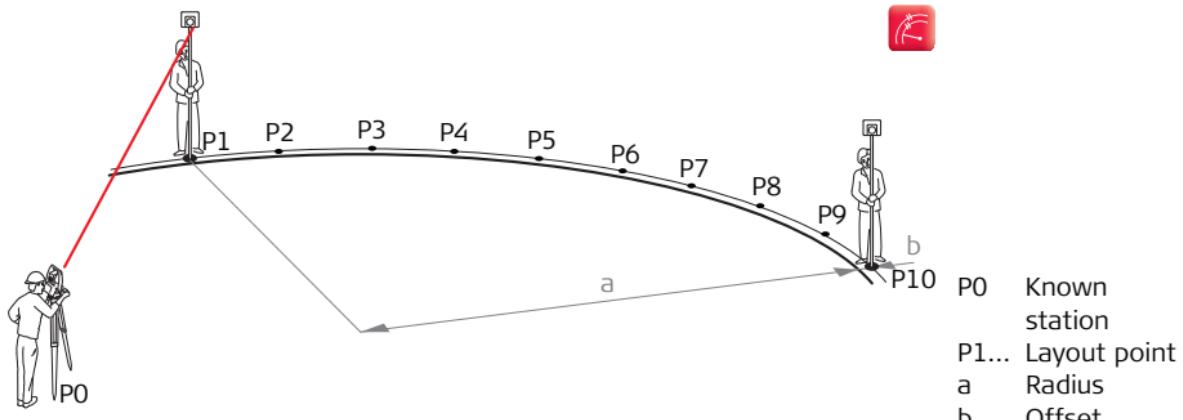


3

Sight target on profile board and press **MEASURE**. Verify line (**Line**) and offset (**offs**) values. Note that these values are absolute values to the control line. Move target along board until offset value is **0.000 [2a]**. Measure and record target to verify results. Mark the point on the profile board [**2b**].



4.5 Layout Pins with Offset for Rounded Curbs



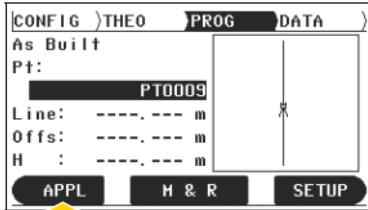
This procedure can also be used, for example, for building up any round formworks.

Given:

- Builder is set up with known station. Setup with height is optional.
- Constructional drawing with dimensioning. The points have been stored in Builder's memory.

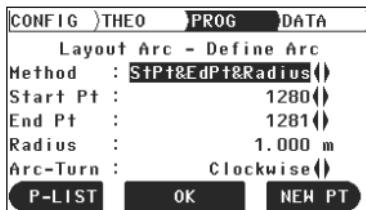
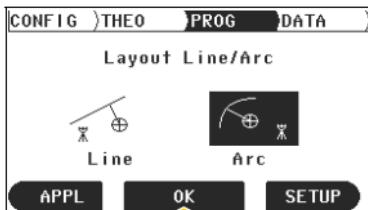
1

In the PROG Tab page, press APPL. Select Layout Line/Arc/Spiral... and Basic....



2

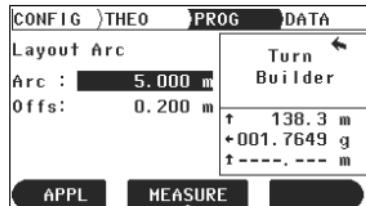
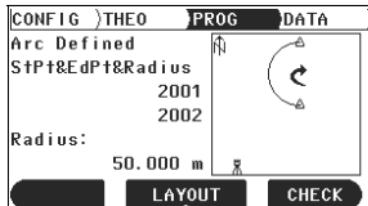
Select Arc. Select the method of how to define the arc, for example Start Point&End Point&Radius, enter or change the other values and press OK.



Refer to the Builder Series User Manual for more details about the different methods.

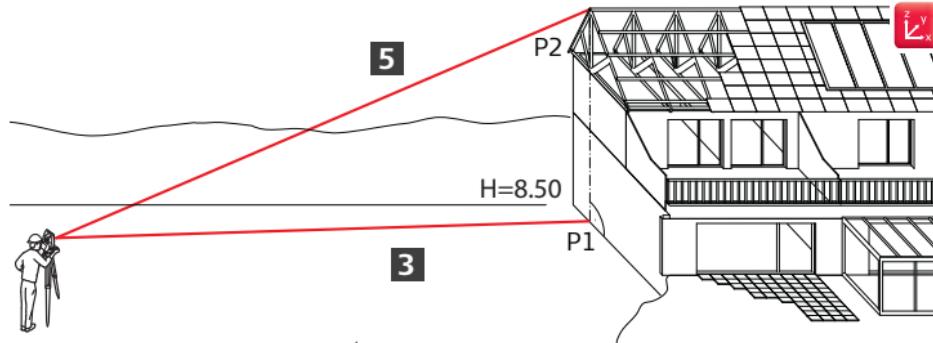
3

Press **LAYOUT**. Enter values for chainage of the arc (**Arc**) and Offset (**Offs**) and begin with layouting.



5 How to Measure Heights

5.1 Measure the Height of Inaccessible Points



P1 Lower point
P2 Upper point



This procedure can be used to measure, for example, the height of buildings, power lines, cranes, ridges, overhead clearances and trees.

Given:

- Builder is set up with height, known station is not necessary.
- Lower point and upper point are nearly in a vertical line.
- Target is measurable reflectorless.

1

In the PROG Tab page, press **SETUP**. Select **Height....**

CONFIG >THEO PROG DATA

As Built

Pt: PT0009

Line: ----- m

Offs: ----- m

H : ----- m

APPL M & R SETUP

CONFIG >THEO PROG DATA

Control Line...

Coordinates...

Height...

OK

2

Enter **0.000 m** for both instrument height (**hi**) and reflector height (**hr**) and press **HTRANS** for height transfer. Press **NEW PT**. Enter a point ID (**Pt**) and press **OK**.

CONFIG >THEO PROG DATA

ESTABLISH HEIGHT

Station H: 421.000 m

hi : 0.000 m

hr : 0.000 m

OK HTRANS

CONFIG >THEO PROG DATA

Select Height Point

Pt : 1100

E : 999.999 m

N : 1086.831 m

H : 118.833 m

P-LIST OK NEW PT

CONFIG >THEO PROG DATA

Enter Point Coordinates

Pt : 1000

E : ----- m

N : ----- m

H : ----- m

ENH=0 OK

3 Press **ENH=0** to set coordinates to 0.000 then press **OK** to store the point. Sight lower point and press **M & R**. Confirm new Station Height with **YES**.

CONFIG >THEO >PROG >DATA	
Enter Point Coordinates	
Pt :	1000
E :	0.000 m
N :	0.000 m
H :	0.000 m
ENH=0 OK	

1.
2.

CONFIG >THEO >PROG >DATA	
Measure Height Point	
PtId:	1000
Hz:	40.000 g
▲:	----.--- m
M & R	

1.

CONFIG >THEO >PROG >DATA	
New Station Height	
1.564 m	
will be set	
NO	NEXT PT
YES	

1.

4 Press **APPL**. Select **Angle & Distance...**

CONFIG >THEO >PROG >DATA	
Layout	
Pt:	*
Pt:	2000
Line:	6.400 m
Offs:	13.700 m
H :	0.000 m
APPL MEASURE SETUP	

1.

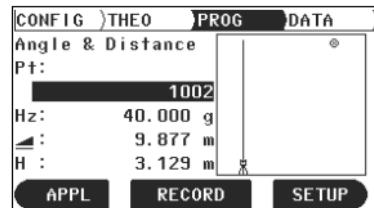
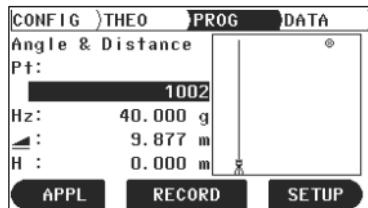
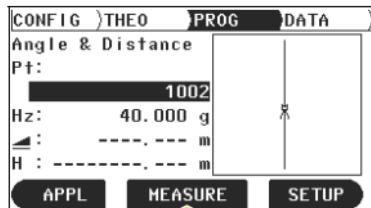
CONFIG >THEO >PROG >DATA	
Layout...	
As Built...	
Angle & Distance...	
Tie Distance...	
Area & Volumes....	
P-LIST	OK
MORE	

1.

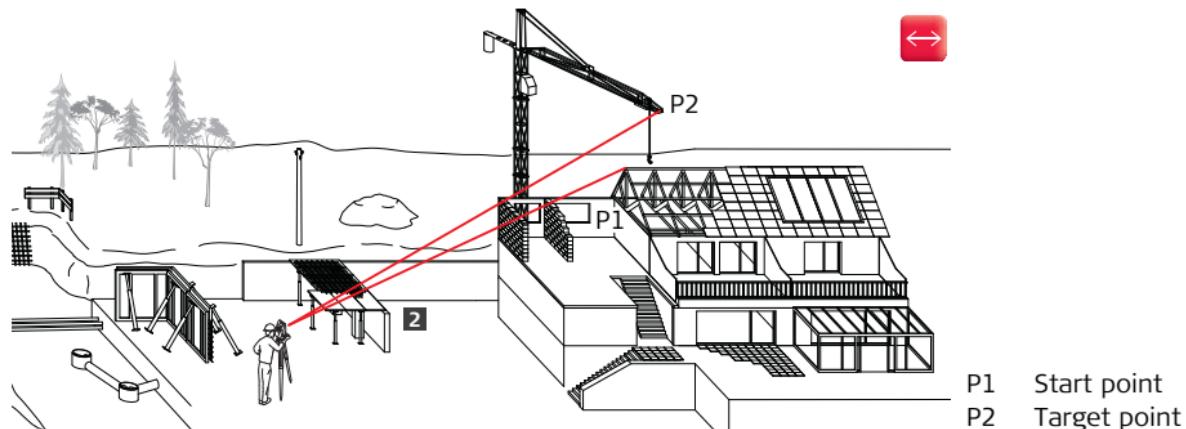
5

Press **MEASURE** to measure the point again. **H** should still be **0.000**. If this is not the case, restart from step 1.

Sight upper point. Now, **H** shows the height of the upper point.



5.2 Measure the Height Difference between Two Inaccessible Points



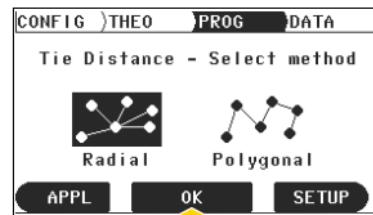
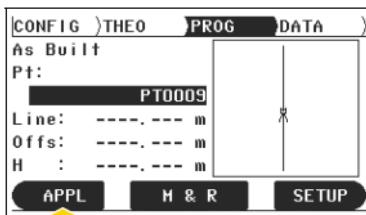
This procedure can be used to measure, for example, the height of buildings, power lines, cranes, ridges, overhead clearances and trees.

Given:

- Builder is set up with height, known station is not necessary.
- Target is measurable reflectorless.

1

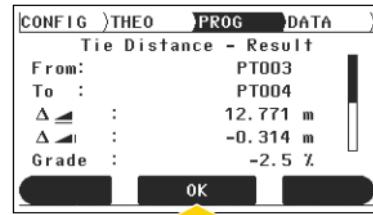
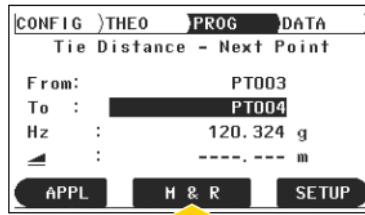
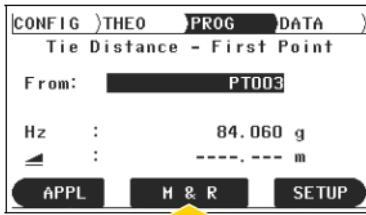
In the PROG Tab page, press **APPL**. Select **Tie Distance...**. Select the method most suitable to your workflow.



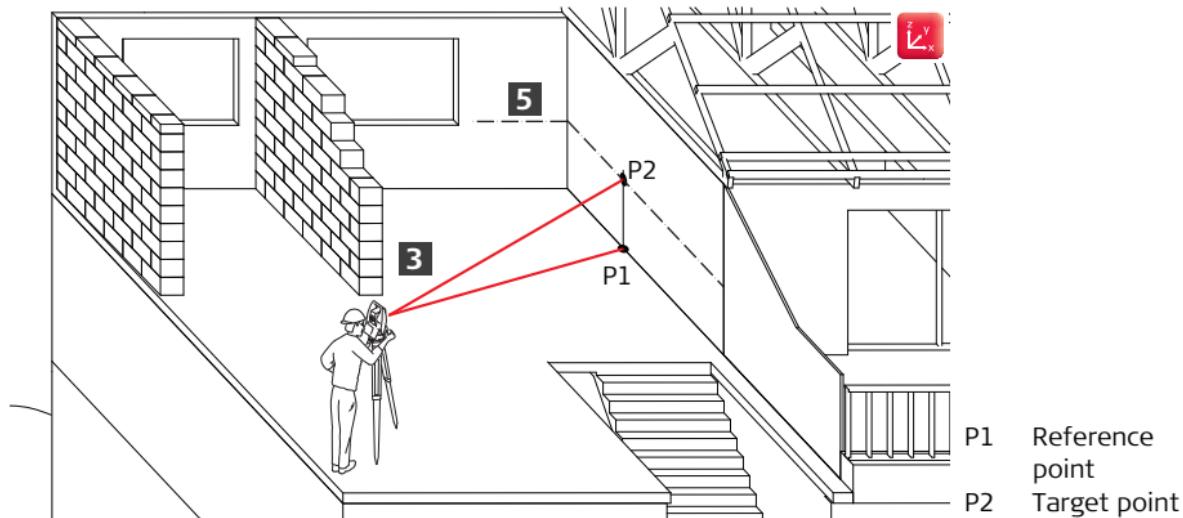
Radial always shows the height difference to the first measured point while **Polygonal** always shows the height difference to the last measured point.

2

Sight start point and press **M & R**. Sight target point and press **M & R**. $\Delta \blacktriangleleft$ shows the height difference between the points.



5.3 Place a Datum Line



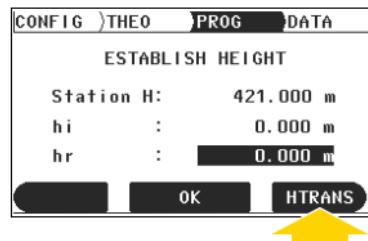
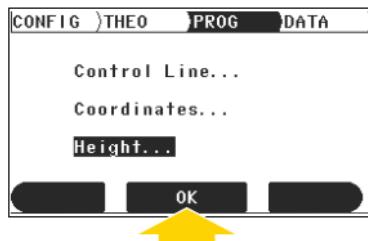
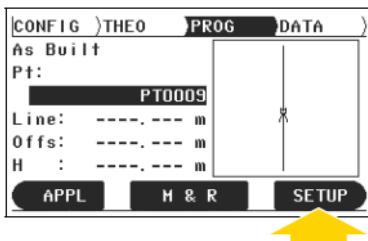
You can also use elevations above sea level for this procedure.

Given:

- Builder is levelled.
- Target is measurable reflectorless.

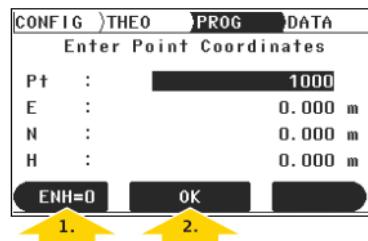
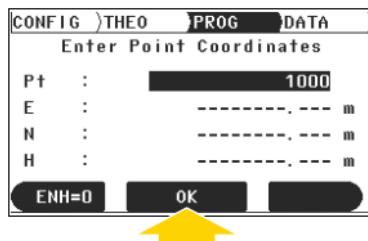
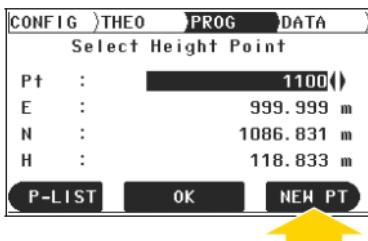
1

In the PROG Tab page, press **SETUP**. Select **Height....** Enter **0.000 m** for both instrument height (**hi**) and reflector height (**hr**) and press **HTRANS** for height transfer.

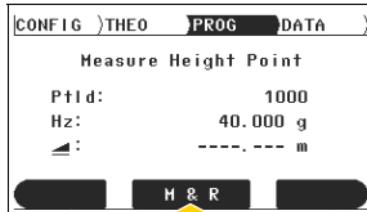


2

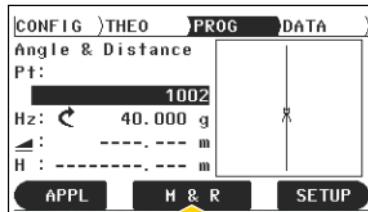
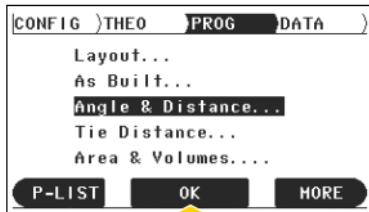
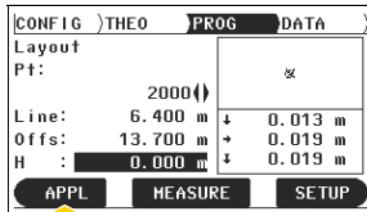
Press **NEW PT** to enter a new point. Enter a Point ID (**Pt**) and press **OK**. Press **ENH=0** to set coordinates to **0.000**. Press **OK** to store the point.



3 Sight a point at the bottom of the wall or a point of a reference height and press **M & R**. New Station Height shows the height difference between point and telescope height. Confirm new Station Height with **YES**.

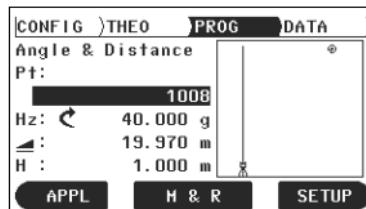
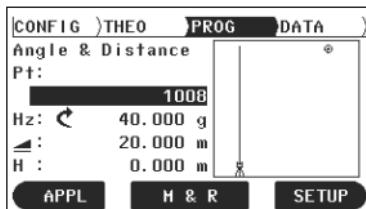
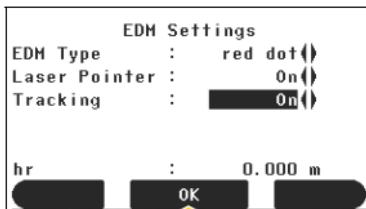


4 Press **APPL**. Select **Angle & Distance....** Measure point again.

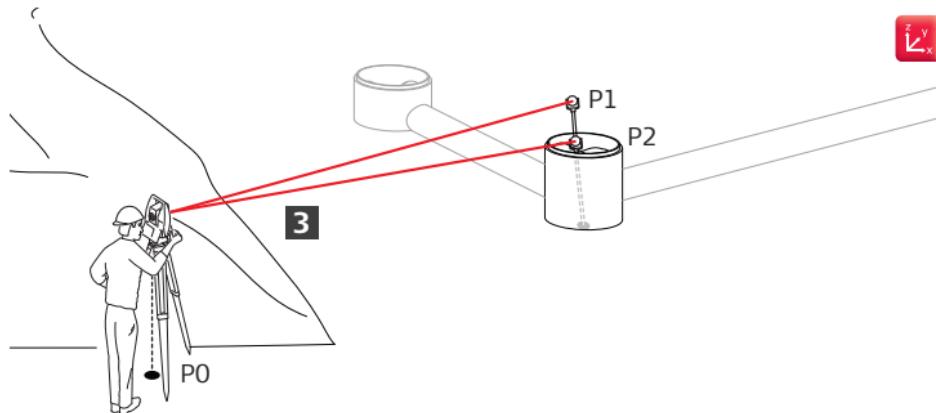


5

Press  to open the EDM Settings. Select **On** for both **Laser Pointer** and **Tracking** and press **OK**. Sight wall for the datum line. Move telescope vertically until **H** shows correct value. Make mark at red dot on wall.



5.4 Determine the Height of the Bottom of a Manhole



P0 Known station

P1 Upper point on rod

P2 Lower point on rod



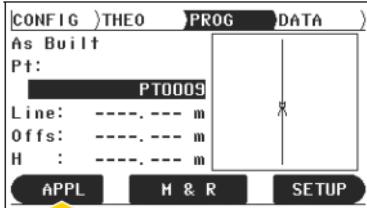
This procedure can be used for every point which cannot be measured directly, for example points behind corners and trees, in chambers and in building pits.

Given:

- Builder is set up with known station and height.
- Rod, folding rod or level staff.

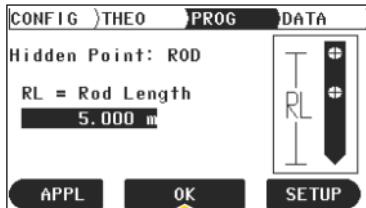
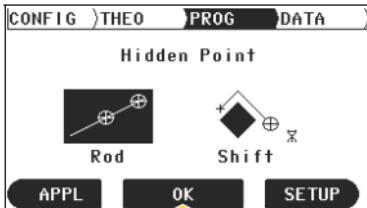
1

In the PROG Tab page, press APPL. Select Hidden Point....



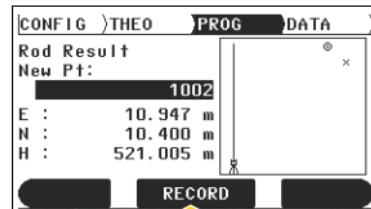
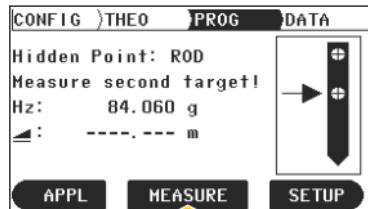
2

Select Rod and press OK. Enter the Rod's length and press OK.



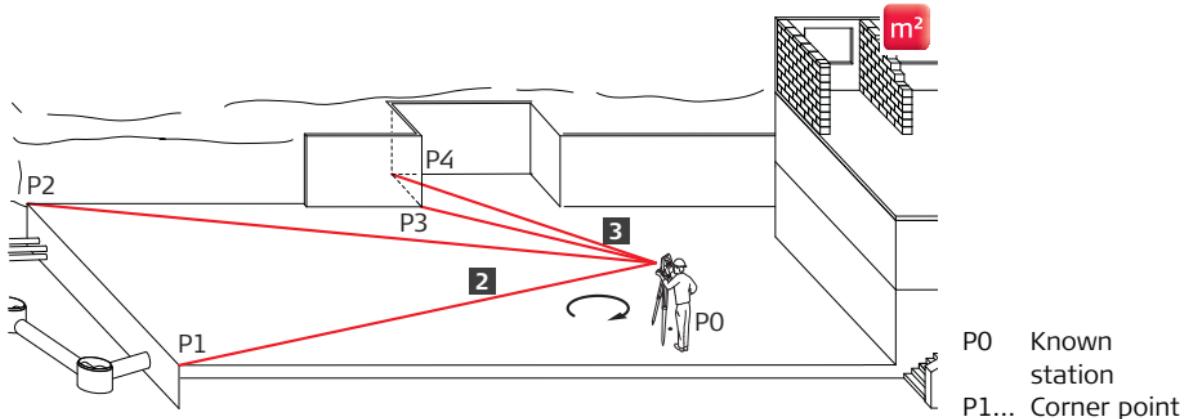
3

Sight upper point on rod and press **MEASURE**. Sight lower point and press **MEASURE**. **H** shows the height of the bottom of the manhole. Press **RECORD** to store the point.



6 How to Measure Areas & Volumes

6.1 Measure and Calculate a Plane Area

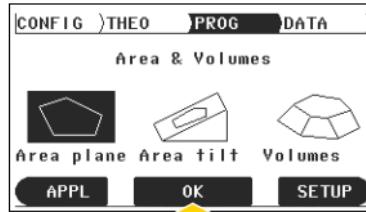
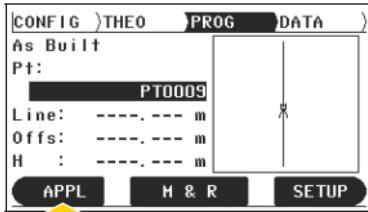
**Given:**

Builder is set up anywhere.

To use the measurement afterwards, Builder must be set up with known station and height.

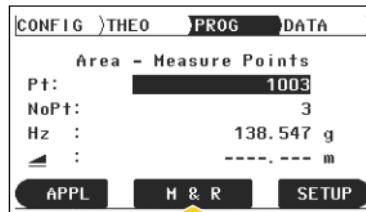
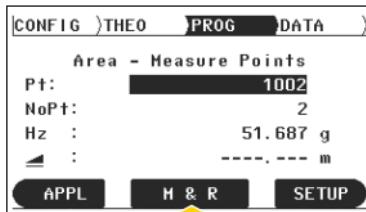
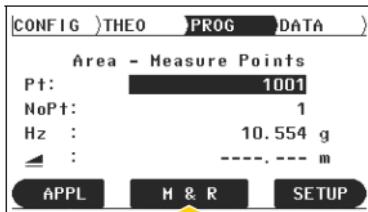
1

In the PROG Tab page, press APPL. Select Area & Volumes.... and Area plane.

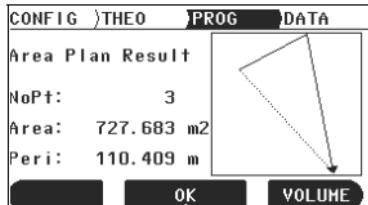
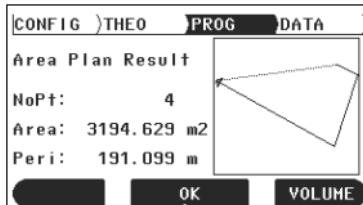


2

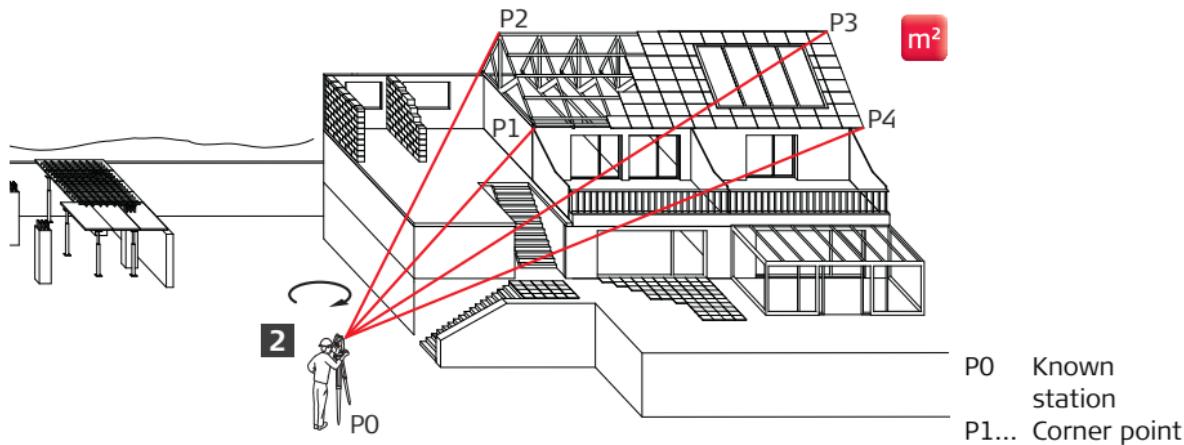
Sight, measure and store the corner points either in clockwise or counter-clockwise direction.



3 After the third point has been measured and stored, a result screen will pop up with an overview about the measured points, the covered area and perimeters. To add more points, press **OK** and sight, measure and store as many points as needed. To leave the application, press **ESC**.

**OK****VOLUME****OK****VOLUME**

6.2 Measure and Calculate a Tilted Area

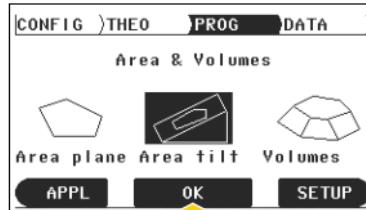
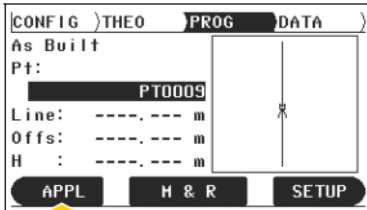
**Given:**

Builder is set up anywhere.

👉 To use the measurement afterwards, Builder must be set up with known station and height.

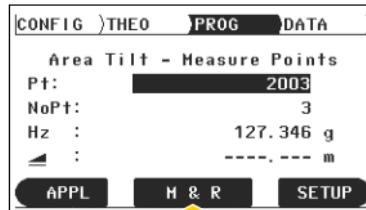
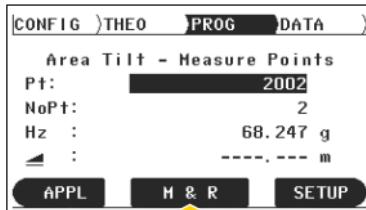
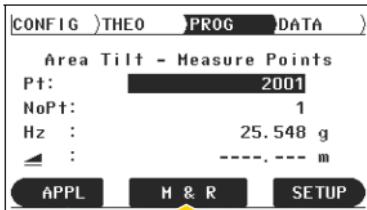
1

In the PROG Tab page, press APPL. Select Area & Volumes.... and Area tilt.

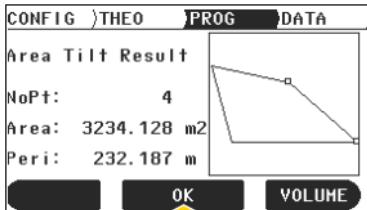
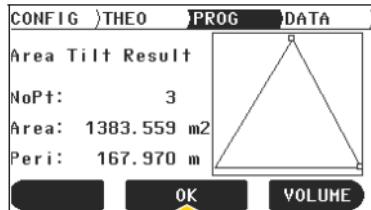


2

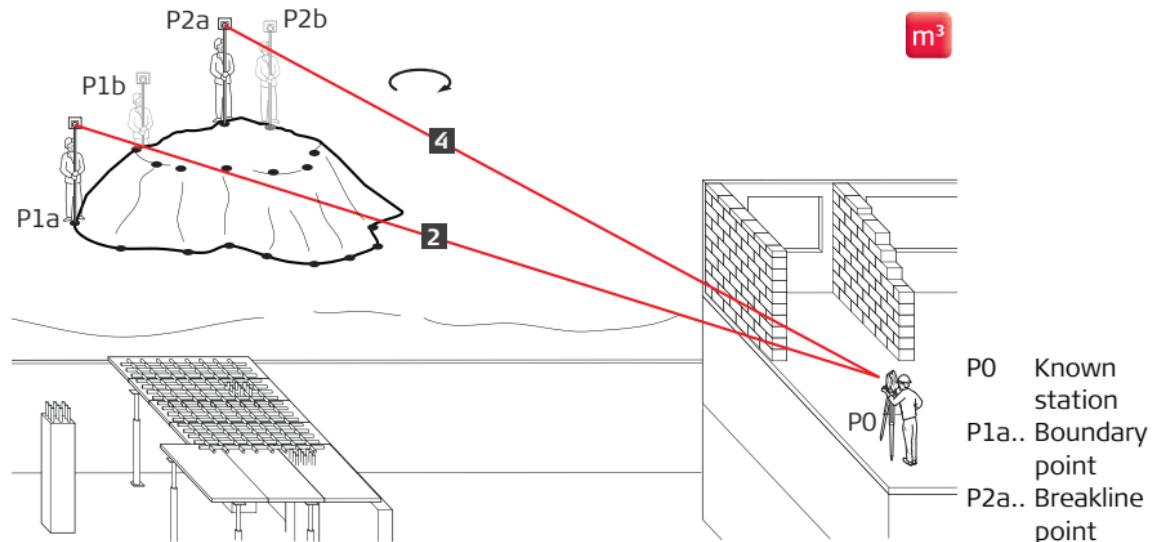
Sight, measure and store the corner points either in clockwise or counter-clockwise direction.



3 After the third point has been measured and stored, a result screen will pop up with an overview about the measured points, the covered area and perimeters. To add more points, press **OK** and sight, measure and store as many points as needed. To leave the application, press **ESC**.



6.3 Measure and Calculate Volumes

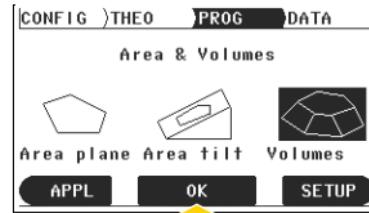
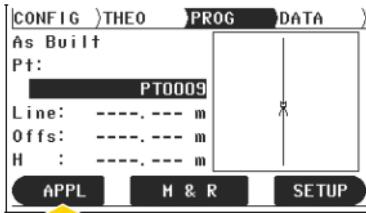
**Given:**

Builder is set up anywhere.

To use the measurement afterwards, Builder must be set up with known station and height.

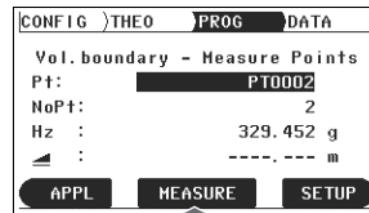
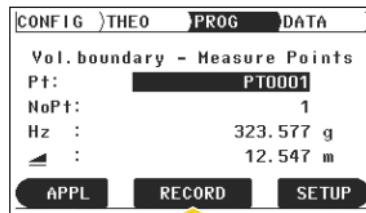
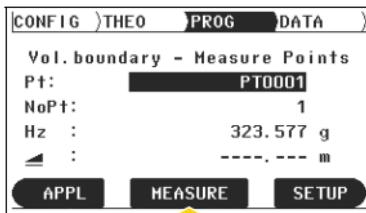
1

In the PROG Tab page, press APPL. Select Area & Volumes.... and Volumes.



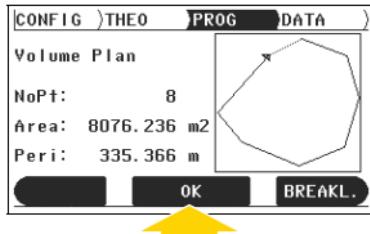
2

Sight first point of boundary and press MEASURE. Press RECORD to store the point. Proceed in the same way for the second point and the third point.

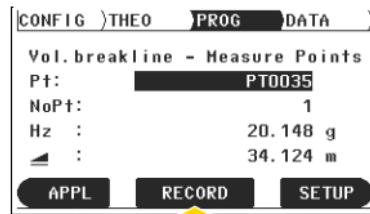
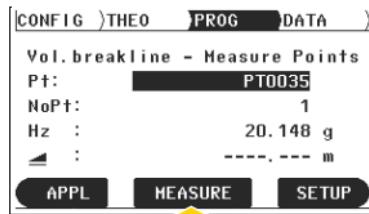
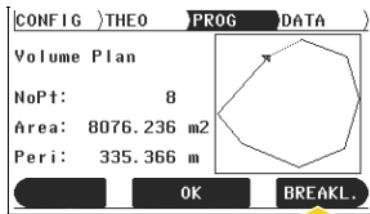


All points need to be measured consistently either in clockwise or in counter-clockwise direction.

3 After the third point has been measured and stored, a result screen will pop up with an overview about the measured points, the covered area and perimeters. To add more points of the boundary, press **OK** and sight, measure and store as many points as needed.

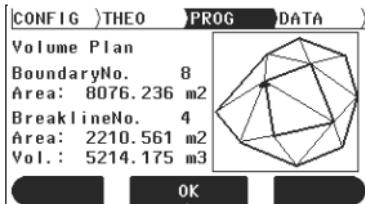
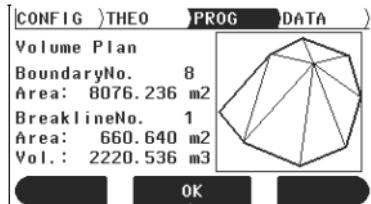


4 After measuring all points of the boundary, the points of the breakline have to be measured. Press **BREAKL**. Sight, measure and store points of the breakline in the same way as points of the boundary.



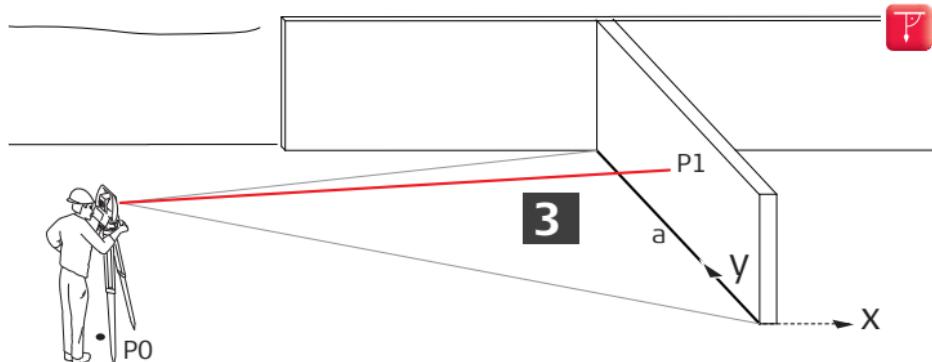
5

After the first point of the breakline has been measured and stored, a result screen will pop up with additional volume information. To add more points of the breakline, press **OK** and sight, measure and store as many points as needed. To leave the application, press **ESC**.



7 How to Check Verticality

7.1 Check the Verticality of a Wall



P0 Known station
P1 Checkpoint
a Control line



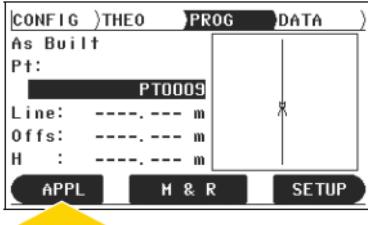
This procedure can also be used to build up and check the verticality of formworks.

Given:

- Builder is set up as described in chapter "1.1 Set Up Anywhere Based on Given Control Line" centrally in front of the wall using the lower left and lower right corner of the wall as the two points of control line.

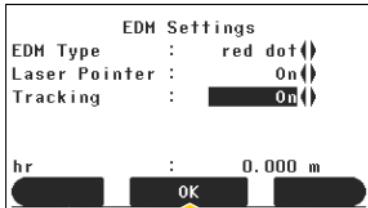
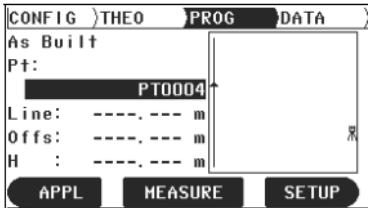
1

In the PROG Tab page, press **APPL**. Select **As built....**



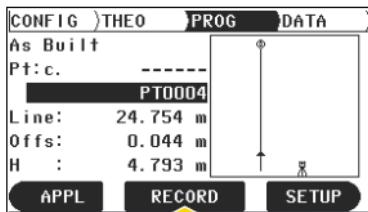
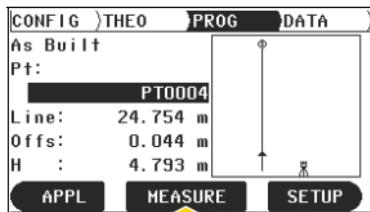
2

Enter ID of start point (**Pt**). Press to open the EDM Settings. For **EDM Type** select **red dot** and for **Tracking** select **On** and press **OK**. Builder will automatically switch back to application As Built.



3 Press **MEASURE** and start moving the telescope up and down. Builder will constantly measure the distance and update line and offset values without storing points. Check **Offs** to monitor the wall's deviation from verticality.

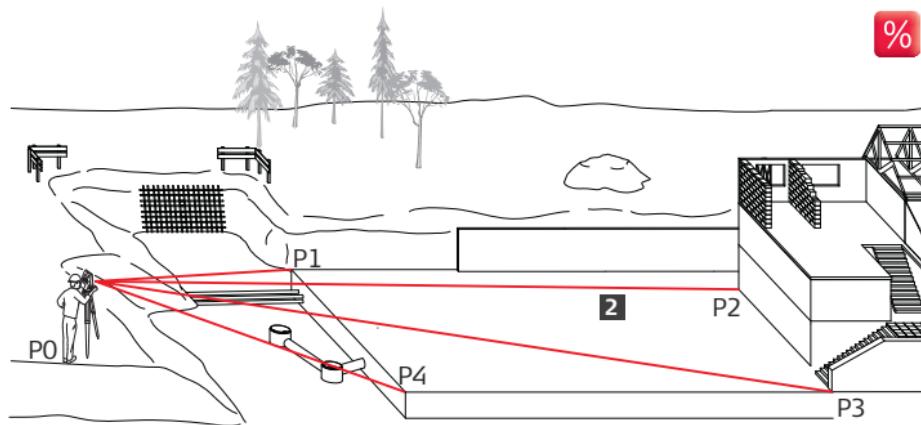
To store the last measured point, press **RECORD**. To stop EDM Tracking, press **ESC**.



8 How to Check Plane or Tilted Surfaces

%

8.1 Check a Plane Surface



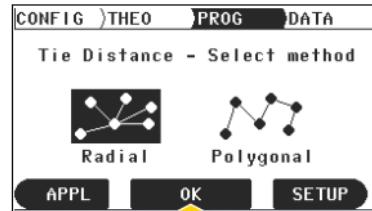
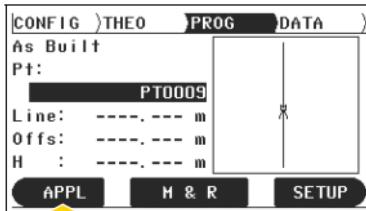
P0 Setup point
P1... Checkpoint

Given:

Builder is set up anywhere.

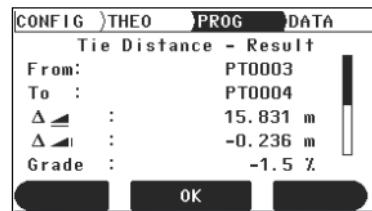
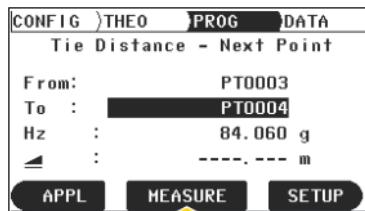
1

In the PROG Tab page, press **APPL**. Select **Tie Distance...** and **Radial**.

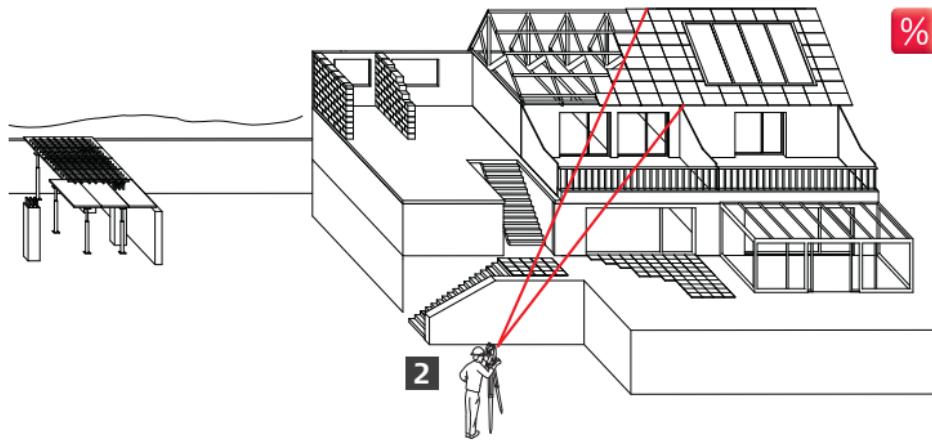


2

Sight start point and press **MEASURE**. Sight target point and press **MEASURE**. The result screen shows the deviations for height ($\Delta \blacktriangleleft$) and **Grade**. For a plane surface both values should show **0**.



8.2 Check a Tilted Surface



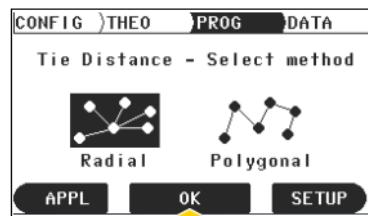
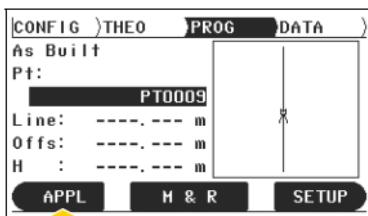
P0 Setup point
P1 Checkpoint

Given:

Builder is set up anywhere.

1

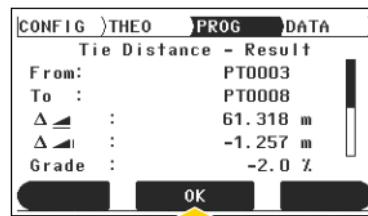
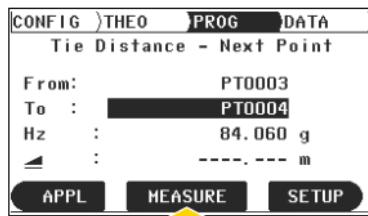
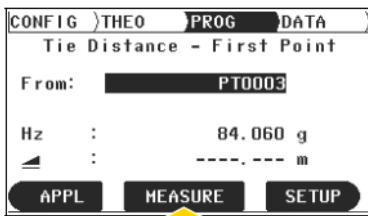
In the **PROG** Tab page, press the **APPL** button. Select **Tie Distance....** Select the method most suitable to your workflow.



Radial always shows the height difference to the first measured point while **Polygonal** always shows the height difference to the last measured point.

2

Sight start point and press **MEASURE**. Sight target point and press **MEASURE**. The result screen shows the deviations for height ($\Delta \blacktriangleleft$) and **Grade**.



Total Quality Management: Our commitment to total customer satisfaction.



Leica Geosystems AG, Heerbrugg, Switzerland, has been certified as being equipped with a quality system which meets the International Standards of Quality Management and Quality Systems (ISO standard 9001) and Environmental Management Systems (ISO standard 14001).

Ask your local Leica dealer for more information about our TQM program.

Leica Geosystems AG

Heinrich-Wild-Strasse
CH-9435 Heerbrugg
Switzerland
Phone +41 71 727 31 31

www.leica-geosystems.com

- when it has to be **right**

Leica
Geosystems

773732-1.0.0en

Original text
Printed in Switzerland © 2009 Leica Geosystems AG, Heerbrugg, Switzerland